1880.

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CONSTITUTION.

TITLE.

ARTICLE I. The Organization shall be known as the United States Naval Institute.

OBJECT.

SEC. 2. All officers of the Navy, Marine Corps, and all civil officers attached to the Naval service shall be entitled to become members without ballot, on payment of dues to the Treasurer, or to the Corresponding Secretary on the station. Other persons may become members, on election by ballot, under the rules governing the election of honorary and associate members (see Art. IV, Sec. 6), and on payment of dues; provided that, the number of members not officially connected with the Navy shall not at any time exceed (50) fifty.

SEC. 3. All those who are entitled to become members, may become life members, on payment of thirty dollars. As a reward for extraordinary services to the Institute, or as a mark of honor, the Institute may create life members without payment of dues: nominations for life members must be made by the Executive

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No. 14.

ERRATA.

Page x, line 7, for Constable read Constructor.

Page xv, line 13, for "Tenton" read "Trenton".

Page xv, line 3 from bottom, for Bachè read Bache.

Page 41, line 9 from bottom, for controls read control.

Page 53, lines 7, 8 and 10 from bottom, for stem read stern.

CONSTITUTION.

TITLE.

ARTICLE I. The Organization shall be known as the United States Naval Institute.

OBJECT.

ART. II. Its object shall be the advancement of professional and scientific knowledge in the Navy.

ORGANIZATION AND OFFICERS.

ART. III. SEC. 1. The officers and permanent committees of the society shall include:—

A President.
A Vice President.
A Secretary.
A Corresponding Secretary.
A Treasurer.
(The Secretary, Corresponding Secretary and Treasurer: Executive Committee.)
A Committee on Publications.
Vice Presidents & Corresponding Secretaries of Branches.

SEC. 2. Special Committees may at any time be appointed by a majority vote of the society to consider questions not properly under the cognizance of the Standing Committees.

MEMBERSHIP.

ART. IV. SEC. 1. The Institute shall consist of members, life members, honorary members and associates.

SEC. 2. All officers of the Navy, Marine Corps, and all civil officers attached to the Naval service shall be entitled to become members without ballot, on payment of dues to the Treasurer, or to the Corresponding Secretary on the station. Other persons may become members, on election by ballot, under the rules governing the election of honorary and associate members (see Art. IV, Sec. 6), and on payment of dues; provided that, the number of members not officially connected with the Navy shall not at any time exceed (50) fifty.

SEC. 3. All those who are entitled to become members, may become life members, on payment of thirty dollars. As a reward for extraordinary services to the Institute, or as a mark of honor, the Institute may create life members without payment of dues: nominations for life members must be made by the Executive

Committee and a majority vote of members shall be required to elect the candidate. The Prize Essayist of each year shall be a life member without payment of dues.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military officers and from eminent men of learning in civil life; provided that the number of such members shall in no case exceed thirty.

Sec. 5. Associates shall be chosen from persons connected with the Naval and Military profession and from persons in civil life who may be interested in the objects that it is the design of the Institute to advance.

Sec. 6. Honorary members and Associates shall be elected as follows: nominations shall be made in writing to the Executive Committee and such nominations, with the name of the member making them, shall be entered on the minutes of the committee. At the succeeding meeting of the Institute, the Committee shall report. If their report be favorable, a majority of the members present shall decide the election; but if unfavorable, a two thirds vote shall be required to elect the candidate. Two members of the Executive Committee shall constitute a quorum for carrying out the requirements of this section.

Sec. 7. The annual assessment for a member shall be three dollars and for an associate one dollar, payable upon joining the Institute and on the first day of each succeeding January.

Sec. 8. Memberships shall be forfeited in cases when the recommendations of the Executive Committee, supported by a two thirds vote of the society, shall so determine, and members two years in arrears shall be dropped. Those who have been dropped from the list of members for being two years in arrears can only regain their membership by paying up their arrears.

NOMINATIONS AND ELECTIONS.

Art. V. Sec. 1. There shall be a meeting of the society on the second Thursday, in January of each year at which all officers shall be chosen, except as provided in Art. VIII. Sec's 6 & 7.

Sec. 2. Members not in attendance may vote by proxy at such elections as well as upon questions relating to the Constitution and By-Laws, but vote by proxy will only be allowed in the two cases herein specified. Life members have full rights with members to vote on any question. Honorary members and associates will not be allowed to vote on any question.

Sec. 3. A majority of votes recorded shall determine choice.

Sec. 4. Members elected to the position of officers of the Society will assume their duties as soon as notified.

Sec. 5. Vacancies may be temporarily filled by the Executive Committee but regular nominations and elections shall follow as soon as practicable.

Sec. 6. All voting for officers shall be by ballot in session of the Society.

DUTIES OF OFFICERS.

Art. VI. Sec. 1. The President, or, in his absence, the Vice President, or in the absence of both, a member of the Executive Committee will preside in Executive session.

Sec. 2. The transaction of all financial, executive or administrative business, in which latter shall be included censorship of papers offered for presentation to the Society, shall be in the hands of the Executive Committee. The Committee will determine for itself its routine of business and form of record.

Sec. 3. The Secretary shall keep a register of the members, a copy of the Constitution and By-Laws, in which he shall note all changes, a journal of the proceedings of the Society, a separate record of the proceedings of the Executive Committee, and a file book in which the reports of Committees shall be entered. These books shall be at all times in readiness for inspection. Papers offered by members unable to be present, if accepted by the Executive Committee, shall be read by the Secretary. He shall give due notice of all meetings of the Society, and shall have control of the stenographer and copyists employed to prepare records of the proceedings.

Sec. 4. The Corresponding Secretary shall attend to all correspondence and keep a record thereof.

Sec. 5. The Treasurer, under the direction of the Executive Committee, shall be the disbursing officer. He shall keep a receipt and expenditure book and an account current with each member. He will submit his books for examination whenever asked for.

Sec. 6. The committee on Publication shall have charge of the printing and publication of all papers and proceedings of the Society.

MEETINGS.

Art. VII. Sec. 1. There shall be a meeting of the society on the second Thursday of each month for the discussion of professional and scientific subjects.

Sec. 2. Special meetings may be called by the Secretary at the request of one or more of the general officers or of standing or special Committees.

Sec. 3. A stenographer shall be employed to keep the record of all proceedings of regular meetings.

Sec. 4. Annually, or as much oftener as the Executive Committee may decide, a record of papers read before the Society and the discussions growing out of them shall be published in pamphlet form. Papers on intricate technical subjects may be published as a part of the proceedings of the Society without being publicly read, if, in the opinion of the Executive Committee, the subject to which they relate be not of a character to be appreciated on merely casual investigation.

BRANCHES.

Art. VIII. Sec. 1. The Executive Committee is empowered to appoint Temporary Corresponding Secretaries for all Naval Stations, both ashore and afloat, where there is no organized Branch; also for Branches where a vacancy exists, owing to the resignation of the Corresponding Secretary before a meeting can be called to elect a successor.

Sec. 2. The officers shall be a Vice President, Corresponding Secretary and an Executive Committee, composed of the Vice President and Secretary ex-officio and one other member.

SEC. 3. The Vice-President of the Branch shall perform the same duty for the Branch as prescribed for the President of the Institute.

SEC. 4. The Corresponding Secretary of a Branch shall keep a register of the members, honorary members and associate members of the Institute residing within the limits of the Station, a copy of the Constitution and By-Laws in which he shall note all changes, and a journal of the proceedings of the Branch. He shall give due notice of all meetings of the Branch, and shall have control of the stenographer and copyist employed to prepare the records of the proceedings. He shall forward to the Corresponding Secretary of the Institute all papers read before his Branch, and shall keep him informed of all new members and their addresses, and of all business, not financial, relating to the Institute. He shall have charge of the library, and of all books and papers, and shall receive and distribute publications. He shall keep a receipt and expenditure book, shall collect dues from all the members on his Station and give receipts therefor. He shall be authorized to expend the funds in his possession for stationery, postage and printing, and for such other expenses as the Executive Committee of his Branch may authorize. He shall, at the end of every month, render to the Treasurer a detailed statement of moneys received, with the names of members from whom received, and shall, at the end of every month, forward to the Treasurer all funds remaining in his hands and vouchers for money expended, retaining sufficient money to defray the current expenses of the Branch.

SEC. 5. Those members of the Institute residing within the limits of a Station where a Branch is established shall be enrolled on the books of the Corresponding Secretary of that Branch during the time of their residence on the Station; they will pay him their dues, keep him informed of their addresses, and receive from him their copies of the publications.

SEC, 6. Monthly meetings of each Branch shall be held upon such dates as the Branch shall decide, and other meetings at the call of its Executive Committee. It shall be the duty of the Executive Committee of the Branch to call an annual meeting for the election of officers of the Institute at a sufficient time prior to the regular meeting of the Institute at Annapolis, for the election of officers, to enable the Corresponding Secretary to forward the votes to the Corresponding Secretary of the Institute. Votes not received at the regular annual meeting of the Institute shall be invalid.

SEC. 7. The officers of a Branch shall be elected for one year at the first annual meeting of the Branch. All voting for officers shall be by ballot in executive session. In the event of the appointment of a Temporary Corresponding Secretary and his acceptance of the appointment, it shall be his duty to call a meeting of all members within the limits of his Station at least one month after his appointment, to organize the Branch, by the election of officers who shall hold office until the regular annual election.

SEC. 8. All papers offered must be submitted for examination to the Executive Committee of the Branch, and if by them accepted they may be read before the Branch and published in the Proceedings. But the Executive Committee of the Institute has a final censorship of all papers before they are published. Papers should be read by authors, or in their absence, by the Corresponding Secretary, unless the author designates a particular person whom he wishes to read the paper.

PAPERS AND PROCEEDINGS.

Art. IX. Sec. 1. The papers and proceedings of the Institute shall constitute assets, and be so borne on the books of the Treasurer and accounted for.

Sec. 2. One copy of the proceedings, when published, shall be furnished to each member, life member, honorary member, and associate member, the Library of the Naval Academy, Corresponding Societies, Congressional Library, Boston Public Library, Library of Harvard University, and Naval Library at Mare Island.

Sec. 3. Back numbers of proceedings shall be furnished to members at a charge which shall be fixed by the Executive Committee. The proceedings may be furnished to non members at a cost ten per cent. higher than that at which they are furnished to members.

Sec. 4. No copies shall be furnished to members who are one year in arrear.

AMENDMENTS.

Art. X. No addition nor amendment to the Constitution and By-Laws shall be made without the assent of two thirds of the members voting. Notice of proposed changes or additions shall be given by the Secretary at least one month before action is taken upon them.

BY-LAWS.

Article I. The rules of the United States House of Representatives shall, in so far as applicable, govern the parliamentary proceedings of the Society.

Art. II. 1. At both regular and stated meetings the routine of business shall be as follows:

2. At executive meetings, the President, or in his absence the Vice-President, or, in the absence of both, a member of the Executive Committee will call the meeting to order and occupy the chair during the session; in the absence of these, the Society will appoint a chairman.

3. At meetings for presentation of papers and discussion the Society will be called to order as above provided, and a chairman will be appointed by the presiding officer, reference being had to the subject about to be discussed, and an expert in the specialty to which it relates selected.

4. At regular meetings, after the presentation of the paper of the evening, or on the termination of the arguments made by members appointed to, or voluntarily appearing to enter into formal discussion, the chairman will make such review of the paper as he may deem proper. Informal discussion will then be in order, each speaker being allowed not exceeding ten minutes in the aggregate unless by special agreement of the Society. The author of the paper will, in conclusion, be allowed such time in making a résumé of the discussion as he may

deem necessary. The discussion ended, the Chairman will close the proceedings with such remarks as he may be pleased to offer.

5 At the close of the concluding remarks of the Chairman, the Society will go into Executive Session, as hereinbefore provided, for the transaction of business, as follows:

1. Stated business, if there shall be any to be considered.
2. Unfinished business taken up.
3. Reports of Officers or Committees.
4. Applications for membership reported.
5. Correspondence read.
6. Miscellaneous business transacted.
7. New business introduced.
8. Adjournment.

OFFICERS OF THE INSTITUTE.

1880.

PRESIDENT,
REAR-ADMIRAL JOHN RODGERS.

VICE-PRESIDENT,
REAR-ADMIRAL G. B. BALCH.

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LIEUTENANT C. BELKNAP.

CORRESPONDING SECRETARY,
PROFESSOR C. E. MUNROE.

TREASURER.
CHIEF ENGINEER JAMES P. SPRAGUE.

COMMITTEE ON PUBLICATIONS,
LIEUTENANT JACOB W. MILLER,
SURGEON M. L. RUTH,
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1874. REAR-ADMIRAL J. L. WORDEN.
1875. REAR-ADMIRAL C. R. P. RODGERS.
1876. REAR-ADMIRAL C. R. P. RODGFRS.
1877. REAR-ADMIRAL C. R. P. RODGERS.
1878. COMMODORE F. A. PARKER.
1879. REAR-ADMIRAL JOHN RODGERS.

BRANCHES.

Washington.

VICE-PRESIDENT,
REAR-ADMIRAL T. A. JENKINS.

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LIEUTENANT E. W. VERY.

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COMMODORE G. M. RANSOM.

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LIEUTENANT E. T. STRONG.

Pacific Station.

VICE-PRESIDENT,
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LIEUTENANT T. B. M. MASON.

North Atlantic Station.

TEMPORARY CORRESPONDING SECRETARY,
LIEUTENANT G. M. TOTTEN.

South Atlantic Station.

TEMPORARY CORRESPONDING SECRETARY,
MASTER H. P. McINTOSH.

LIST OF MEMBERS.

391.

April, 1880.

(Notice.—Members are requested to notify the Secretary if their address is incorrectly given, and also when their address is changed.)

ABBOTT, C. W., PAY DIRECTOR, Navy Yard, Boston.
ACKLEY, S. M., LIEUTENANT, Coast Survey Office.
ADAMS, J. D., " Pensacola, Pacific Station.
ALLDERDICE, W., ENSIGN, Hagerstown, Md.
ALLEN, G. M., ASSISTANT PAYMASTER, Adams, Pacific Station.
ALLEN, L. J., CHIEF ENGINEER, "Marion," Pacific Station,
ALLEN, L. W., PAYMASTER, "Constitution."
ALLEN, W. A. H., PASSED ASSISTANT-ENGINEER, Navy Department.
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AMMEN, D., REAR-ADMIRAL, Beltsville, Md.
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BARKER, A. S., COMMANDER, Light-House Inspector, New Orleans, La.
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BARTLETT, H. A., CAPTAIN U. S. M. C. Navy Department.
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BEAUMONT, H. N., SURGEON. "Marion," Pacific Station.

BEAUMONT, T. C., Commodore. Navy Yard, Portsmouth.
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BRIDGMAN, W. R., Commander. Light House Insp., Buffalo, N. Y.
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BROWN, R. M. G., Lieutenant. "Alarm," New York.
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BROWNE, S. T., Paymaster. "Powhatan," North Atlantic Station.
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HEMPHILL, J. M.. Lieutenant, Naval Observatory.
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HIGGINSON, F. J., Commander, Despatch, European Station.
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HOLDEN, E. S., Professor, Naval Observatory.
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HOWISON, H. L., Commander, Navy Yard, Washington.
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HUNTER, H. C., Lieutenant. "Alert," Asiatic Station.
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HUTCHINS, C. T., Lieutenant. Navy Yard, Washington.
IDE, G. E., Lieutenant. Alliance, European Station.
INGERSOLL, R. R., Lieutenant. "Pensacola," Pacific Station.
IRWIN, W. M., Master. "Michigan."
IVERSON, A. J. Lieutenant. Boston Navy Yard.
JACKSON, S., Medical Director. Boston, Mass.
JACOBY, H. M., Master. Coast Survey Office.
JAQUES, W. H., Lieutenant. 25 Halleck St., Newark, N. J.
JASPER, R. T., Lieutenant. Naval Academy.
JEFFERS. W. N., Commodore. Naval Department.
JENKINS, T. A., Rear Admiral. 2115 Pennsylvania Ave., Washington.
JEWELL, T. F., Lieutenant Commander. Coast Survey steamer Gedney.
JOHNSON, A. W., Captain. Navy Department.
JONES, D., P. A. Engineer. "Nipsic," Atlantic Station.
JONES, J. H ., Lieutenant Colonel, M. C. Navy Yard, Boston.
JONES, M. D., Passed-Assistant Surgeon. Naval Academy.

JONES, W. H., Surgeon. Naval Hospital, New York.
JOUETT, J. E., Captain. Navy Department.
JUDD, C. H., Lieutenant. Hydrographic Office.
KAFER, J. C., Passed-Assistant Engineer. Naval Academy.
KARNEY, T., Librarian. Naval Academy.
KEARNY, G. H., Passed-Assistant Engineer. Naval Academy.
KEELER, J. D., Lieutenant. Hydrographic Office.
KELLY, J. D. J., Lieutenant.
KENNEDY, D., Lieutenant. "Pensacola," Pacific Station.
KIRBY, A., Past-Assistant Engineer. Navy Yard, Washington.
KNAPP, H. S., C.-Midshipman. Pensacola, Pacific Station.
KNOX, H., Lieutenant. "Adams," Pacific Station.
LAMBDIN, W. J., Chief Engineer. "Shenandoah," S. Atlantic Station.
LAW, R. L., Captain. Navy Department.
LAWRENCE, J. P. S., Asst. Engineer. "Pensacola" Pacific Station.
LEACH, B., Master, "Constitution."
LEARY, R. P., Lieutenant-Commander. Pensacola, Pacific Station.
LEE, S. P., Rear-Admiral. 1653 Penn. Ave., Washington.
LEITCH, R. R., Assistant-Engineer. 1707 Penn. Ave., Washington.
LENTHALL, J., Naval Constructor. 1818 F. St., Washington.
LEROY, W. E., Rear-Admiral. New York Hotel, New York.
LILLIE, A. B. H., Lieutenant. "Nipsic," N. Atlantic Station.
LITTLE, W., Lieutenant. Minnesota, New London.
LITTLE, W. Mc C., Lieutenant. Navy Yard, New York.
LLOYD, E. jr., C.-Midshipman. "Pensacola," Pacific Station.
LONGNECKER, E., Lieutenant. Naval Observatory.
LORING, C. H., Chief Engineer. Navy Yard, New York.
LULL, E. P., Commander. Coast Survey Office.
LYETH, C. H., Master. Navy Yard, New York.
LYON, H. W., Lieutenant. 34 Monument Square, Charlestown, Mass.
MACKENZIE, M. R. S.. Lieutenant. Naval Academy.
MAHAN, A. T., Commander. Naval Academy.
MANNING, C. H., Passed-Assistant Engineer. Naval Academy.
MANSFIELD H. B., Lieutenant. Navy Yard, New York.
MASON, T. B. M., Lieutenant. "Pensacola," Pacific Station.
MATTHEWS, E. O., Commander. Navy Yard, New York.
MC ALLISTER, A. A., Chaplain. Pensacola, Pacific Station.
MC CANN, W. P., Captain. Navy Yard, Mare Island.
MC CARTNEY, C. M., Ensign. "Nipsic," N. Atlantic Station.
MC CARTNEY, D. P., Passed-Asst. Engineer. Navy Yard, Washington.
MC COOK, R. S., Commander. Navy Yard, New York.
MC CORMICK, A. H., Commander. Navy Department.
MC CRACKIN, A., Lieutenant. Naval Academy.
MC GOWAN J. jr., Lieutenant Commander. Marion, Pacific Station.
MC GREGOR, C., Commander. Navy Yard, Boston.
MC INTOSH, H. P., Master. Shenandoah, S. Atlantic Station.
MC LANE, ALLAN, Esq. Washington, D. C.

MC LEAN, T. C., Lieutenant. "Trenton,"European Station.
MC MAIR, F. V.,Commander. Naval Academy.
MC NARY, I. R., Chief Engineer. Kearsarge," N. Atlantic Station.
MC RITCHIE, D. G., Lieutenant. "Tallapoosa," N. Atlantic Station.
MEAD, W. W., Lieutenant. 58 W. 5th St. Covington, Ky.
MEIGS, J. F., Lieutenant. "Pensacola," S. Pacific Station.
MENOCAL, A. G., Civil Engineer. Navy Yard, Washington.
MERRELL, J. P., Lieutenant. "Marion," Pacific Station.
MILES, C. R., Master. Naval Academy.
MILLER, F. A., Lieutenant. "Ticonderoga."
MILLER, J. M., Lieutenant. "Constitution."
MILLER, JACOB W., Lieutenant. Naval Academy.
MOORE, J. H., Lieutenant. "Constitution."
MOORE, J. W., Chief Engineer. Board of Inspectors, Navy Dept.
MOORE, W. I., Lieutenant. "Marion," Pacific Station.
MUNROE, C. E., Professor. Naval Academy.
MURDOCK, J. B., Lieutenant. "Constitution."
MUSE, W. S., 1st Lieut. U. S. M. C. Artillery School, Fortress Monroe.
NAZRO, A. P., Lieutenant. "Constitution."
NELSON, H. C., Medical Inspector. "Pensacola," Pacific Station.
NELSON, T., Lieutenant Commander. 1419 Q Street, Washington.
NEWCOMB, S., Professor. Nautical Almanac Office.
NEWELL, H., Chief Engineer. Navy Yard, Norfolk.
NICHOLS, H. E., Lieutenant. Coast Survey Office, Washington.
NICHOLS, S. W., Commander. Navy Yard, Boston.
NICHOLSON, J. W. A., Commodore. Navy Yard, New York.
NICHOLSON, R. F., Ensign. "Portsmouth," Washington.
NICKELS, J. A. H., Lieutenant. Boston, Mass.
NICOLL, W. L., Past Assistant Engineer. Trenton, N. J.
NORRIS, G. A., Lieutenant. Navy Yard, New York.
NORTON, C. F., Lieutenant. "Nipsic," North Atlantic Station.
NORTON, C. S., Commander. Light House Insp., Charleston, S. C.
NOSTRAND, W. H., Ensign. Coast Survey Office.
NOURSE, J. E., Professor. Naval Observatory.
NOYES, B., Lieutenant. P. O. Box 2280, New York City.
O'NEIL, C., Lieutenant-Commander. Navy Yard, Boston.
OSTERHAUS, H., Master. Coast Survey Office.
PAINE, F. H., Lieutenant. "Trenton", European Station.
PAINE, S. C., Lieutenant. Naval Academy.
PARKER, J. B., Surgeon. "Wachusett," South Atlantic Station.
PARKER, W. H., Lieutenant. Naval Academy.
PATCH, N. J. K., Lieutenant. "Richmond", Asiatic Station.
PAUL, A. G., Lieutenant. "Powhatan", North Atlantic Station.
PAUL, H. M., Astronomer. Naval Observatory.
PECK, G., Medical Director. Navy Department.
PECK, R. B., Lieutenant. "Pensacola," Pacific Station.
PENDLETON, C. H., Lt.-Comd'r. 126 W. Madison St., Baltimore, Md.

PENDLETON, E. C., Lieutenant. "Swatara," Asiatic Station.
PERKINS, G. H., Commander. Concord, N. H.
PERKINS, H., Lieutenant. "Vandalia," North Atlantic Station.
PERRY, T., Lieutenant. "Swatara," Asiatic Station.
PHILLIPPI, E. T., Past Assistant Engineer. Asiatic Station.
PHYTHIAN, R. L., Commander. 935 K Street, Washington.
PICKING, H. F., Commander. "Kearsarge," North Atlantic Station.
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RANSOM, G. M., Commodore. Navy Yard, Boston.
READ, G. A., Past Assistant Paymaster. Navy Department.
READ, J. J. Commander. Light House Insp., St. Louis, Mo.
REAMEY, L. L., Master. Hydrographic Office.
REES, C. P., Master. Naval Academy.
REEVES, I. S. K., Assistant Engineer. "Adams," Pacific Station.
REISINGER, W. W., Lieutenant. 1209 13th Street, Washington.
REITER, G. C., Lieutenant. Light House Office, Portland, Oregon.
REMEY, E. W., Lieutenant. "Trenton," European Station.
REMEY, W. B., Captain U. S. M. C. Navy Department.
RHOADES, W. W., Lieutenant. Anacostia P. O., D. C.
RICE, J. M., Professor. Naval Academy.
ROBESON, H. B., Commander. Naval Academy.
ROBIE, E. D., Chief Engineer. "Pensacola," Pacific Station.
ROBINSON, L. W., Passed Assistant Engineer. Naval Academy.
RODGERS, C. R. P., Rear Admiral. "Pensacola," Pacific Station.
RODGERS, J., Rear Admiral. Naval Observatory.
RODGERS, W. L., Cadet-Midshipman. "Pensacola," Pacific Station.
ROELKER, C. R., Passed Assistant Engineer. Navy Department.
ROSS, A., Lieutenant. Annapolis, Md.
ROWAN, S. C., Vice Admiral. Navy Department.
RUSH, R., Lieutenant. Naval Academy.
RUSSELL, B. R., 1st Lieut. U. S. M. C. "Minnesota," New London, Ct.
RUTH, M. L., Passed Assistant Surgeon. Naval Academy.
SAMPSON, W. T., Commander. "Swatara," Asiatic Station.
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SARGENT, N., Master. "Portsmouth," Washington.
SAWYER, F. E., Master. Coast Survey Office.
SCHOULER, J., Lieut.-Commander. Arlington House, Washington.
SCHROEDER, S., Lieutenant. Hydrographic Office.
SEBREE, U., Lieutenant. Coast Survey Steamer "Bachè."
SELFRIDGE, J. R., Lieutenant. Navy Yard, Washington.
SELFRIDGE, T. O., Rear-Admiral. 2013, I St. Washington.

SHAW, C. P., Lieutenant. Hydrographic Office.
SHEPARD, E. M., Commander. Naval Academy.
SHOCK, W. H., Engineer in Chief. Navy Department.
SICARD, M., Commander. Navy Yard, Boston.
SIGSBEE, C. D., Lt.-Commander. 72, West St., Georgetown, D. C.
SIMPSON, E., Commodore. Naval Station, New London.
SKERRETT, J. S., Captain. Light-House Inspector, Portland, Me.
SKINNER, A. N., Astronomer. Naval Observatory.
SLACK, W. H., Master. "Saratoga," Washington.
SLOANE, J. D., Assistant Engineer. "Kearsarge," N. Atlantic Station.
SMITH, D., Chief Engineer. "Nipsic," North Atlantic Station.
SMITH, J. A., Paymaster. Navy Pay Office, Washington.
SMITH, W. D., Passed-Assist. Engineer. Navy Yard, Norfolk.
SNYDER, H. L., Chief-Engineer. Navy Yard, New York.
SOLEY, J. C., Lieutenant. Naval Academy.
SOLEY, J. R., Professor. Naval Academy.
SOUTHERLAND, W. H. H. Master. "Kearsarge," N. Atlantic Station.
SPEEL, J. N., Passed-Assistant Paymaster. New London, Conn.
SPERRY, C. S., Lieutenant. "Richmond," Asiatic Station.
SPEYERS, A. B., Lieutenant. Naval Academy.
SPRAGUE, J. P., Chief Engineer. Naval Academy.
STANTON, J. R., P.-A. Paymaster. "Kearsarge," North Atlantic Station.
STANTON, O. F., Captain. "Constitution."
STAUNTON, S. A., Master. "Swatara," Asiatic Station.
STEPHENSON, F. B., P.-A. Surg., "Shenandoah," South Atlantic Station.
STEVENS, T. H., Commodore. Navy Department.
STOCKTON, C. H., Lieutenant. Navy Yard, New York.
STOCKTON, H. T., Lieutenant. London, England.
STRONG, E. T., Lieutenant. Navy Yard, Boston.
STRONG, W. C., Lieutenant. "Enterprise," European Station.
TANNER, Z. L., Lieutenant. Hydrographic Office.
TAUSSIG, E. D., Lieutenant. 1219, Dolman St., St. Louis, Mo.
TAYLOR, H. C., Lieutenant-Commander. Navy Yard, Washington.
TERRELL, T. C., Lieutenant. "Constitution."
TERRY, E., Commander. "Pensacola," Pacific Station.
TERRY, N. M., Professor. Naval Academy.
THACKARA, A. M., Lieutenant. Navy Yard, Washington.
THOMAS, C., Master. Nautical Almanac Office.
THOMAS, C. M., Lieutenant. "Constitution."
THOMAS, E. B., Lieutenant. Coast Survey Office.
TILLEY, B. F., Lieutenant. Naval Academy.
TILLMAN, E. H. C.-Midshipman. "Shenandoah, South Atlantic Station.
TILTON, McL., Captain M. C. Annapolis, Md.
TOTTEN, G. M., Lieutenant. "Tennessee," North Atlantic Station.
TRAIN, C. J., Lieutenant-Commander. Naval Academy.
TRIBOU, D. H., Chaplain. Navy Yard, Boston.
TRILLEY, J., Chief Engineer. "Wabash," Boston.

TRUXTUN, W. T., Captain. Navy Yard, Norfolk.
TRYON, J. R., Surgeon. Sturdevant House, New York.
TURNER, T. J., Med. Inspector. Navy Department.
TURNER. W. H., Lieutenant. Navy Yard, Portsmouth.
TYLER, G. W., Lieutenant. Naval Academy.
UPSHUR, J. H., Captain. 1721, Rhode Island Ave., Washington.
VERY, E. W., Lieutenant. Navy Signal Office.
VREELAND, C. E., Master. "Ticonderoga."
WADHAMS, A. V., Lieutenant. "Nipsic," European Station.
WARD, A., Master. "Constitution."
WARING, H. S., Master. "Saratoga," Washington.
WASHINGTON, R., Pay Inspector. "Richmond," Asiatic Station.
WATSON, E. W. Lieutenant. Navy Yard, Norfolk.
WEBB, T. E., Naval Constructor. Navy Yard, New York.
WELLS, C. H., Captain. Navy Department.
WELLS, H., Passed Assistant Surgeon. Naval Hospital, Norfolk.
WEST, C. H. Lieutenant. "Alliance," North Atlantic Station.
WHITE. U. S. G., Civil Engineer. Navy Yard, Boston.
WILLIAMS, W. W., Pay Inspector. Navy Yard, Washington.
WILSON, D. L. Master. 53, Bridge St., Georgetown, D. C.
WILSON, J. C., Lieutenant. "Tennessee," North Atlantic Station.
WINDSOR, W. A., P.-A. Engnr. "Kearsarge," North Atlantic Station.
WINSLOW, F., Master. 104, Chestnut St., Boston, Mass.
WISE, F. M., Lieutenant. Naval Academy.
WOOD, E. P., Lieutenant. "Enterprise," European Station.
WOOLVERTON, T., Surgeon. "Powhatan," North Atlantic Station.
WORDEN, J. L., Rear-Admiral. 1428, K. St., Washington.
WRIGHT, A. H., Lieut.-Commander. 23, Jenning's Ave., Cleveland, O.
WYMAN, R. H., Rear-Admiral. "Tennessee," North Atlantic Station.
YATES, I. I., Lieutenant. "Pensacola," Pacific Station.
ZANE, A. V., Assistant Engineer. Naval Academy.

LIFE MEMBERS,—2.

COMMANDER A. D. BROWN. Naval Academy.
HON. R. B. FORBES, Milton, Mass.

HONORARY MEMBERS,—5.

CHIEF JUSTICE C. P. DALY, American Geographical Society, 11 West Twenty-ninth Street, New York.
C. W. ELIOT, LLD., President, Harvard University, Cambridge, Mass.
CAPTAIN J. ERICSSON, 36 Beach Street, New York.
C. P. PATTERSON, LLD., Superintendent. Coast Survey.
HON. R. W. THOMPSON, Secretary of the Navy.

ASSOCIATE MEMBERS,—17.

ACKLAND, W. A. D., Comdr. R. N. H. B. M. S. Triumph, Pacific Station.
BAILEY, N. P., Esq. 11 West Twenty-eighth Street, New York.
BATTEN, A. W. C., Lieut. R. N. H. B. M. S. Triumph, Pacific Station.
BRENTON, R. O. B. C., Lieut. R. N. " "
BOUTELLE, C. O., Assistant Coast Survey. Norfolk, Va.
BROOKE, J. M., Esq. Virginia Military Institute.
CHASE, LESLIE, Esq. 30 Broad Street, New York.
DORR, E. P., Esq. Buffalo, N. Y.
FORSTER, E. J., Dr. Charlestown, Mass.
HOFFMAN, J. W., Esq. 259 South 17th Street, Philadelphia, Pa.
HUNT, W. P., Esq. South Boston Iron Works.
METCALFE, H., Captain U. S. A. Frankford Arsenal, Philadelphia, Pa.
MILLER, H. W., Esq. Morristown, N. J.
MYERS, T. B., Esq. 4 West 34th Street, New York.
NORDHOFF, C., Esq. Alpine, Bergen Co., N. J.
PEGRAM, J. C., Esq. 43 North Main Street, Providence, R. I.
ROOSEVELT, N. L., Esq. 14 Waverley Place, N. Y.

DEATHS,—3.

Commodore F. A. PARKER, June 10, 1879.
Commander CHESTER HATFIELD, December 15, 1879.
Medical Director J. W. TAYLOR, January 19, 1880.

CORRESPONDING SOCIETIES.

American Geographical Society.
Association Parisienne des Propriétaires d'Appareils à Vapeur.
Société des Ingénieurs Civils.
American Institute of Mining Engineers.
U. S. Military Service Institution.
American Society of Civil Engineers.

SECRETARY'S REPORT.

U. S. Naval Institute.
Annapolis, Md., Jan'y 8th, 1880.

During the past year, the affairs of the Institute may be said to have met with unvarying success. The membership has increased until it now amounts to members, 368; honorary members, life members, and associate members, 14; and the establishment of the Branches attests the interest felt by officers, and their appreciation of the privileges and advantages of debate. The total number of papers presented during the year was twenty-four, of which the Executive Committee, exercising a just though not rigid censorship, have printed twenty. A number of professional papers on topics of general interest have been inserted, which, for various reasons, were not read at any meetings.

The notices of the Prize Essay on Naval Education were responded to by the presentation of ten essays for competition, a fact that cannot fail to be gratifying to those who initiated the movement. The judges selected were President Eliot, of Harvard University, Rear Admiral Ammen, of the Navy, and Engineer-in-Chief Shock, of the Navy. The judges were requested to name the most distinguished paper, and two others which they considered most worthy of comment. Their onerous task was accomplished with a skill and delicacy which, while it conferred high honors on the successful contestants, gilded the bitter pill of failure for the others.

The wisdom of the Institute in establishing its annual prize is also shown in the spirited discussions which took place, both in the Institute and in the public prints, proving that the Prize had been the means of stirring up many minds to thinking very seriously on a question of great professional importance.

The subject of the Essay for 1880 was recommended by a committee of officers and approved by the Institute. The Naval Policy of the United States. The judges selected by the Executive Committee, are Hon. Wm. M. Evarts, Secretary of State, Hon. R. W. Thompson, Secretary of the Navy, and Hon. J. R. Mc Pherson, Senator. Eight es-

says have been presented, which were forwarded to the judges on the seventh of January. The judges have been requested to specify only the most deserving essay.

From a pecuniary point of view, it is desirable to diminish somewhat, the number of papers, and at the same time to increase the interest felt by members, in *participation* in the proceedings. I therefore recommend that a plan of general discussion on the same subject, in the Institute and its Branches at the same time, be adopted by the Executive Committee, so that original papers may be presented in certain months, and general discussion on fixed professional subjects take place on the alternate months.

JOHN C. SOLEY, Secretary.

TREASURER'S REPORT.

U. S. Naval Institute.
Annapolis, Md., Jan'y 7th, 1880.

Gentlemen:

I beg leave to submit the enclosed report of the receipts and expenditures of the Institute, from Jan'y 7, 1879, to Jan'y 7, 1880; and in connection therewith, I would state that there are 378 names borne on the books of the Treasurer, 10 of which are over two years in arrears; and by the Constitution will be dropped from this date; thus leaving

368 paying members, at $ 3.00	$ 1,104
7 associate " " 1.00	7
giving a total income of	$ 1,111

There is now in the printer's hands work to the amount of (probably) nearly $ 300.00. And there is the coming "Prize Essay" and Medal to provide for, to the amount of $ 150.00; which will leave in hand only about $ 75.00 of the $ 525.70 shown in the tabulated report.

It will be seen that during the year past the amount expended for printing, (when paid for) will be nearly $ 1,185.00, which amounts to nearly the whole income of the Institute; leaving comparatively nothing for other expenses; the only way this was provided for in 1879, was by the surplus which had accumulated, on account of the yearly dues being $ 5.00 (instead of $ 3.00), and the small number of papers printed in previous years; it is therefore evident that, on account of the reduction of the yearly dues, and the greatly increased number of papers offered, (the number of members having largely increased) there must be some rule in regard to what papers shall be published; as it will be impossible to print, hereafter, as many as were printed in 1879, because during this year some $ 350.00 was expended for this purpose, *more* than the present income of the Institute will warrant.

Respectfully,

JAMES P. SPRAGUE,

Treasurer U. S. N. I.

Amounts Received

by the Treasurer of the U. S. Naval Institute, from Jan'y 7th, 1879, to Jan'y 7th, 1880, inclusive.

From the former Treasurer, W. T. Sampson,	$439 34
For dues received at Annapolis,	644 85
" dues received from Wash't'n Branch, J. H. Moore, Sec'y,	505 00
" " " " " " E. W. Very, Sec'y,	21 00
" " " " Norfolk Branch, W. E. Watson, Sec'y,	51 00
" " " " Norfolk, per J. H. Moore,	51 00
" " " " New York Branch, C. H. Stockton,	78 00
" " " " Lieut. McIntosh, Cor. Sec'y,	9 00
" Proceedings, Papers &c.,	16 25
	$1,815 44

Amounts Expended.

Bills paid for Printing Committee,	$885 62
Am't paid for "Prize Essay" and Medal, A. D. Brown,	150 00
For postage on Proceedings, Stamps and Wrappers,	93 95
" freight on Proceedings and Papers,	36 30
" Paper, Envelopes and Blank Books,	25 15
" Expenses of Wash't'n Branch as per acc't rendered,	66 45
" " " Norfolk " " " " "	6 77
" " " New York " " " " "	10 50
" Services of I. Glynn, to former Secretary and Treasurer,	15 00
	$1,289 74
Cash in hands of Treasurer to balance,	525 70
	$1,815 44

Note—Jan'y 20th, 1880. Since the Annual Report the number of members has been increased by thirty-nine; as follows:

Associate members 10, Boston Branch 21, South Pacific 17, Annapolis 1, total, 49.

THE PROCEEDINGS

OF THE

UNITED STATES NAVAL INSTITUTE.

Vol. VI. 1880. No. XI.

BOSTON BRANCH.

January 31st, 1880.

Commander S. D. Ames, U. S. N., in the chair.

OUR RIFLED ORDNANCE,

By Lieut. H. W. Lyon, U. S. N.

Mr. Chairman and Gentlemen :—

My endeavor in this paper will be to lay before you the efforts that have been made during the past few years by the Ordnance Bureau of the Navy Department to increase the efficiency of our ordnance; and to discuss the results attained in the three types of guns now being issued for service. These are the 8 inch M. L. R., converted from XI inch S. B., the breech loading rifles converted from Parrott M. L. R., of the same calibre, and the 3 inch steel B. L. Howitzer.

Undoubtedly we are very far behind the great military nations of Europe in the production of heavy rifled guns, and this paper will entirely omit the consideration of smooth-bores, but there have been and still are, many reasons, entirely beyond the control of our ordnance officers, why, since the late war, we have remained almost at a stand-still.

It has simply been a question of want of money, and it is not necessary to more than hint at some of the reasons why money has been withheld; the national debt with which the country became burdened, and which at first seemed so overwhelming, the eager set of the people to return to the paths of peace, to renew the suspended, and to rebuild the broken branches of trade and industry, the general feeling that war, for this generation, and probably the next, was a thing of the past; the pressure of tax payers on their representatives to reduce

all expenses; and other causes equally apparent have tended to a neglect of our armament on land and sea, and have resulted in that starvation policy regarding ships and ordnance which we feel so keenly. It is well when the question arises, as it so often will, "Why are we not making guns to compete with those of the greater foreign powers?" to weigh all these things carefully and to assign the blame where it justly belongs.

Working along with what little money could be obtained, but mostly with the proceeds of the sale of old material, the Ordnance Bureau, has converted upwards of fifty XI inch S. B., into 8 inch M. L. R., by lining with coiled wrought iron tubes, a number of 100 pdr. and 60 pdr. Parrotts into 80 pdr. and 60 pdr. B. L. R. by inserting a short steel tube from the breech, and has introduced a steel B. L. Howitzer of 3 inch caliber. I will take up these guns in turn, as being improvements on our ordnance of five years ago, and call your attention to what there is to be said in their favor. I do not by any means advocate resting satisfied with these guns. What I wish to say is this; if it be impossible to get appropriations to manufacture guns such as are developing such wonderful power abroad, but if at the same time we can get just enough, either by appropriation or sale of useless material, to improve any old guns already on hand, it would seem clearly our duty to do so. It is a decided, if not a long, step in the right direction. It is what we see being done in a greater or less degree in all the constructive bureaus, and although we may, in our natural eagerness to compete with the most advanced nations in all matters relating to our naval economy, chafe at and hastily condemn as "makeshifts" all utilizations of old types of guns, ships or engines, still, we must allow that it is better than doing nothing at all. It is certainly making an advance, doing our best under embarrassments, and at the same time showing ourselves worthy of greater trusts in the future. It is indisputably better than sitting down with folded hands to await the dawn of a new era that, in coming, would find us totally unprepared to cope with its responsibilities.

Keeping in view, then, the rigid economy forced upon the Ordnance Bureau, we find that the conversion of the XI inch, S. B., into 8 inch R. was attended with little of the expense inseparable from a new or experimental type of gun. It was, in fact, no longer an experiment, but demonstrable by theory, and proved by exhaustive trials in England, and satisfactory experiments at Sandy Hook, by our Army Ordnance officers, that a cast iron gun could be lined with a wrought iron

tube and be sufficiently strong to leave a wide margin of strength with the then service charges. From the same reasoning, as from actual experiment, it will be seen that the heaviest battering charges can also be used.

In England, as early as 1855, a great many devices were proposed and many of them tested, to strengthen the cast iron ordnance of the day to meet the increased strain to which guns were subjected by the use of heavy elongated projectiles. Among others were shrinking onto the breech of the gun wrought iron bands and wrought iron jackets (our Parrott system), putting on a bronze jacket, and lining with steel tubes of various qualities, but without any decided success, and it was not until 1863 that the Palliser system of lining a cast iron gun, previously bored out to a size greater than the original caliber, was proposed, and experiments were made with it. These experiments extended over several years and the results were so satisfactory that it was recommended by the Ordnance Select Committee of 1868 to make extensive conversions of smooth bore guns on this principle, "in order," to quote the words of the report, "to provide at a cheap rate rifled ordnance for secondary purposes of defence." This recommendation was carried out so far that there are now in service over two thousand of these converted guns, which are, as a general thing, distributed among the smaller vessels of the navy, and mounted in sea-coast fortifications where there is a limited range. Sir William Palliser claims that not a single gun converted on his system has ever failed or burst in service; and in exhaustive proof firing where extreme efforts were made to burst the guns it took most extraordinary measures to accomplish it, as will be seen by a few examples given below, which are taken from the report of the Ordnance Select Committee.

1. A 6.5 inch gun burst at the eighty-first round of a proof series with 16 lb. charges and cylinders increasing by the weight of one shot every tenth round. The weight of the cylinder used when the gun burst was 599 lbs, length 74 inches, length of cartridge about 16 inches, while the total length of bore was 123.75 inches.

2. A 6.3 inch, gun converted from a 32 pdr. burst after 111 rounds of a proof series, with cylinders from 50 to 150 lbs., while firing a 150 lb. cylinder and 30 lbs. of powder, splitting externally but not going to pieces. Five shells containing 4½ lb. bursting charges had been intentionally burst in the bore, but notwithstanding this the gun was subsequently loaded with ease.

3. Another gun of eight inches caliber converted from a 10 inch

S. B. was fired with extreme charges and 180 lb. shell, with ten to fifty inches air spaces, and four shell with 12½ lb. bursting charges were intentionally burst in the bore. This gun is still good.

4. Another extraordinary example is that of a X inch cast iron gun converted into an 8 inch rifle and weighing but four and one-half tons, proved as is the 8 inch Woolwich gun of nine tons with two charges of 39 ½ lbs. R. L. G. powder and shell of 180 lbs. This gun as a smooth bore had gone through the siege of Sebastopol, had been struck by Russian shot, and the vent had become so enlarged as to admit a man's finger. After the two regular proof rounds this gun was loaded with a charge of 22 lbs. of powder and a shell of 120 lbs. containing a 12 lbs. bursting charge. This shell was put into the bore with its point towards the charge, the fuze hole left open, and rammed home. Five rounds were thus fired, bursting the shell each time, but even after that, and although the bore was necessarily somewhat scored up, the gun was easily loaded. After this the gun was fired several times with fifty inch air spaces purposely left between the powder charge and projectile, but I do not attach much importance to this test of a gun's strength, as it has long been known in this country, where, after the war, a Parrott gun was subjected to extreme tests, that such air spaces diminish the pressure on the walls of the gun*

Many more examples could be given, but I will only refer to a recent experiment of Sir Wm. Palliser, the report of which is taken from the United Service Gazette of Dec. 26th. "Several rounds were fired from a Palliser gun which was double loaded in each case. The last round consisted of ten pounds of powder and a 66 lb. shot, then another charge of ten pounds of powder with another 66 lb. shot. Both projectiles were fitted with the service gas check, recoil tremendous, but gun remained uninjured. This gun is a 32 pdr. cast iron smooth bore converted into a 64 pdr. rifle by lining with a tube two inches thick, and weighs only three tons. The previous history of the barrel of this gun is somewhat remarkable. It formerly belonged to another 32 pdr. which it converted into a 64 pdr. rifle, and was tested by firing excessive charges; next a series of shells, filled with powder, was purposely burst inside it; and, finally, it was deliberately

*In the case here cited with the Parrott gun the diminished pressures were seen from the decreased expansion of the rotating band as the projectile was separated from the charge, while recent experiments with the "Thunderer's" gun No. 2, where pressure gauges were used, gave the same results.

tested to destruction by charges of increasing severity. Towards the end of the programme it fired five rounds of thirty pound charges of R. L. G. powder and 100 lb. rifled shot. At last the wrought iron barrel bulged to the extent of one quarter of an inch, and cracked the casing harmlessly through a hole that had been bored into it near the trunnions, the charge being thirty pounds of R. L. G. powder and a 150 lb. shot. The bulged barrel was then taken out of its casing, and the bulged part, two feet long, was bored out. A new lining about one half of an inch in thickness was inserted, which brought the bore back to its original size. The external bulge was next turned off in a lathe, and the barrel was then put into its present cast iron gun.

The experiments at Sandy Hook by a Board of Army officers were rather more what would be called legitimate, and had reference to ascertaining the life-time of the converted gun. I have not the latest reports on the Sandy Hook firing, but from the last report of the Chief of Ordnance, General Benet, to which I have had access, I quote the following results: —

A X inch Columbiad converted into an 8 inch M. L. R. by lining with a coiled wrought iron tube made at the Elswick gun factory in England was quite serviceable after eight hundred and seventy-six rounds with 35-lb. charges and 180-lb. projectiles.

A X inch Columbiad converted into a 9 inch M. L. R. was in perfect condition after five hundred and two rounds.

Another X inch Columbiad converted into an 8 inch M. L. R. with a tube made by the West Point foundry looked better after five hundred rounds than the English tube after the same number.

A X inch Columbiad converted into an 8 inch M. L. R. by lining with a steel tube blew to pieces after four hundred and fifty six rounds. From all this it may well be claimed that the Bureau of Ordnance did not proceed to the conversion of its XI inch S. B. guns into 8 inch rifles without knowing what to expect of them, and we see the announcement of the proposed conversions in the report of the Secretary of the Navy for 1875 where he says "that the necessity of arming some of our ships with rifled cannon is so obvious and pressing that, pending the construction of new guns, the Department proposes to convert a limited number of XI inch S. B. into safe and efficient rifles, by the insertion of wrought iron tubes, the recent conversions made by the Army Ordnance having clearly determined the practicability of making them with safety and certainty."

Let us pass now from the strength and safety of this system to the

increase in power and efficiency of the rifled gun over the original smooth bore.

A comparison of the muzzle energies of the XI inch S. B. and the 8 inch R., the former with a solid shot of 166 pounds and the latter with a battering shell of 180 pounds, shows in foot tons 2627 to 1300 in favor of the rifle, or about twice as much. In shell firing we have in the smooth bore a shell of 136 pounds, with a six pounds bursting charge, and in the rifle a shell of 180 pounds, with an eleven pounds bursting charge. The muzzle energies with service charges are still in favor of the rifle,—1798 to 1446 foot-tons. At 1000 yards, 1397 to 648. At 2000 yards, 1179 to 322. The trajectory of the rifle shell is much flatter, giving a less angle of fall, and consequently increasing the dangerous zone. At 2000 yards, for example, it is for the rifle, 5° 14′, and for the smooth bore, 10° 48′.

The tubes are made at the West Point foundry, Cold Spring, N. Y., and, briefly, the process is this: bars of carefully selected and worked iron, of about thirty-six feet in length, are heated to a good red, in a long blast furnace, and then rolled up over a revolving mandrel, six and one-half inches in diameter and slightly tapering towards one end. This leaves a spiral coil, which is brought up to a welding heat in another furnace, put into a pot and "coil welded," as it is called, under the hammer. Two of these welded coils are then welded together, and the whole becomes a "section:" two sections give the required length of tube. The lower end of the tube is turned down, and a jacket, made in the same manner as the rest of the tube, is shrunk on with moderate tension. Between the inner tube and jacket runs a spiral gas channel, which comes out at the bottom of the tube and communicates with a gas channel through the casing or gun proper. This would become a tell-tale in case of a rupture of the inner tube along the powder chamber and seat of projectile. The end of the tube is closed with a screw plug. The tube, having successfully passed a water proof, is rifled and turned down to thirteen and a half inches, when it is inserted in the gun, which has been bored out to that diameter, with a clearance that must not exceed .007 of an inch at the lower end nor .015 of an inch at the muzzle. The tube is secured in the gun by a muzzle collar, and from turning, on account of rifling, by a securing pin at sixty inches from the muzzle. As lining the XI inch gun in this way throws the center of gravity forward, giving a muzzle preponderance, the trunnions are turned down from a center forward of the old one, and by then putting on eccentric composition rings the center comes

one and a half inches forward of the original one and gives the gun a breech preponderance of about 280 pounds. The weight of the gun will average about 17, 360 pounds. The rifling is a uniform twist of one turn in sixty calibers, fifteen lands and fifteen grooves, equal in width, and .075 of an inch depth of grooves.

In proof firing the charge of twenty pounds of hexagonal powder was hardly sufficient to set out the walls of the tube; but with the 35-lb. charges now used the tube is thoroughly set out, showing that the pressure on the cast iron casing is due to the extra fifteen pounds. After proof, it is impossible to get the tube out without boring. A 10 inch rifle blew out the forward end of the tube during proof trial, at Sandy Hook, owing to a defective weld in the tube, which was made in England. Attempts were made to pull out the breech end, and the force from six sixty-ton jacks applied, but to no purpose. It was then bored out.

As to the range of this gun, the whole question is one of opinion as to what is required in naval shell firing. Actions where this class of gun would be of any great use are not likely to be fought at over one thousand yards, and the real damage heretofore done by shell guns in naval engagements has been within that distance. What we want, therefore, is a shell of the largest possible capacity to be accurate at that distance. We can well afford to sacrifice a few hundred yards of range in order to throw a mine of powder into an enemy's ship. The English are firing a four caliber shell for that purpose, and report the accuracy as quite satisfactory up to two thousand yards, although the flight is somewhat noisy. Our shell is but 2.8 calibers, as our pitch of rifling is somewhat slower than the English, and is also satisfactory for the same distance. Our battering shell of 2.5 calibers with the 35 lb. charge has an excellent flight for four thousand yards and upwards, and the new common shell lately ordered are for the consolation of those who prefer accuracy to power, and will also be of 2.5 calibers. It was supposed by many officers who used the 8 inch rifle for the first time, firing low charges with long shell, that the unsteady flight after the first five or six hundred yards was a great defect, but the shell was carrying about eleven pounds of powder as a bursting charge, and the accuracy was good, as I said before, for the ranges contemplated. The shell were reported as tumbling, but from my experience at the proving ground at Nut Island, where we fired at a distant target, the shell merely wabbles. There was apparently a center of gyration that developed itself as the velocity decreased, and gradually came farther and farther to the rear from the front as the shell went on, increasing

the wabbling. If the flight were long enough this center of gyration would eventually get to the center of gravity, and the shell would certainly tumble.

The XI inch gun was not converted into a breech loader, for the reason that it is mainly designed for use in our present cruising vessels as a shifting pivot gun for spar decks, and there would be little if any advantage gained from rapidity of fire or convenience in loading. The cost of conversion in that case, and we must keep the cost in view, for reasons already given, would be as great as that of a new gun better adapted to breech loading. The army X inch gun is, from its form, better adapted for a breech loader, but either is but a "make-shift."

Among those who have had much to do with converted guns of this kind there are many warm advocates of building new guns on the Pallisser system. Experimental guns of 12.25 and 10 inch caliber have given very good results at Sandy Hook.; and if, as has been stated in reports of the recent experiments of Krupp at Meppen, the pressures did not in any case exceed twenty tons while producing the wonderful results obtained there, there is no reason why we should not reproduce these velocities and energies, by casting a gun long enough to burn to advantage an equally good powder from an enlarged chamber, and using our system of rifling and projectiles.

The next gun to be taken up is the converted Parrott, where the caliber of the original gun is not changed, and, besides being strengthened in the manner so much used by the French, by inserting a short steel tube from the rear, it becomes a breech loader.

The first 100 pdr. Parrott converted had a long jacketed tube inserted from the rear and secured at rear, and front ends by collars similar to the muzzle collar of the 8 inch Rifle. A second gun was converted by inserting a tube of tough steel from the rear to about one foot in advance of the vertical plane of the trunnions. The old rifling was kept on along the tube. In this case the tube was screwed into the cast iron casing left-handed, so that the tendency of the rifled motion would be to tighten it. These guns were made breech loaders on the slotted screw system,—so much used by the French that it is often called the French or Reffye system.

The strength of the gun is certainly increased by this conversion, and by consulting the report of the Secretary of the Navy for 1878 we find in the range tables that the power and efficiency of the gun is practically the same with the present service charges.

Quite a number of 100 pdr. Parrotts have been converted on this

principle into 80 pdr. B. L. R. and 60 pdr. Parrotts into 60 pdr. B. L. R. Besides this, sample guns of 30 and 20 pdrs. have been converted. I think the great advantage to the navy in this conversion of Parrott guns lies in the knowledge we gain by working up the subject of breech loaders. So far it has always been with the slotted screw system, which, while often called the French, is, in conception, purely American. To the French belongs the credit of developing and applying it, and, in their service firing, of more than sixty thousand rounds, with heavy guns of from 42 to 16 centimeters, they have had no accidents attributable to the system.

This system was patented in this country by B. Chambers, of Washington, in 1849, and tested in 1851 in a 12 pdr. smooth bore with fixed metallic cartridges, center primed with a percussion cap. It worked sufficiently well to suggest further trials, which were recommended by Commodore Morris, then Chief of the Bureau of Ordnance, but the suggested experiments were not carried out, on account of the expense, and for the reason, too, that an efficient system of muzzle-loading guns (Dahlgren) had just been introduced. This system was next taken up and worked out in France in 1859 by Colonel Treuille de Beaulieu, and the most advantageous form, diameter, length, and pitch of screw worked out by actual experiment. No slotted screw has ever failed by stripping, even when more than half of the threads have been purposely removed. There are arguments in favor of either a large or small diameter of breech plug, but, as a matter of fact, neither the Reffye, with a very large screw, nor the De Barge, with a very small screw, nor the Bureau of Ordnance regulation, which is medium, has ever failed, though in extreme proof the whole breech has been blown out.

The army ordnance has had converted, at the works of the South Boston Iron Company, a X inch columbiad into an 8 inch B. L. R., on the sliding wedge system of Krupp, which has given great satisfaction, but the slotted screw mechanism would seem to have advantages over it, for these reasons: In small guns, by having folding handles, all the breech mechanism can be concealed within the breech; it is readily examined after every fire, and, each part being in plain view, is easily wiped out; admits of the cup gas check which gives the best seal and reduces the area on which gas pressure acts, and is cleaned during loading. It does not require so accurate an adjustment, does not so easily get out of order, and spare parts can be easily substituted.

I learn from the Inspector of Ordnance at Cold Spring that the 80,

60, 30 and 20 pdrs. which he has proved worked perfectly, and were loaded with the greatest ease and rapidity.

There is nothing to be said about the steel 3 inch B. L. Howitzer that is not good. It is now being issued to all vessels fitting out, and gives great satisfaction as to strength, range and accuracy. It is moreover very light, is easily loaded and taken care of, and with the proposed improvements of the cup gas check, and a straight, perpendicular vent, will equal if not excel any arm of its kind. Before being issued for service these guns are bronzed by a process of successive oxidations, which when finally burnished gives them a color resembling rosewood, and a polished surface that will resist the friction of coarse emery paper, while the coating is supposed to have a penetration of .005 of an inch.

The projectiles used in the larger rifles are of the patterns known as Parrott and Butler, and as their difference lies mainly in the expanding band, are essentially of the same type, the rifled motion in each case being given by the expansion of the soft composition band into the grooves of the gun. Either form efficiently rotates the projectile, but, as in the Butler patent the annular groove in which the gas acts also tends to make the band grip the base of the shell all the tighter. I am in favor of it as being safer in firing over boats or the heads of troops. At the Sandy Hook experiments these projectiles have given entire satisfaction, and the system has been practically adopted by the army.

The subject of projectiles is an extremely important one and should be considered in connection with the system of rifling. The Parrott projectile and rifling combined were in advance of their time as was the Rodman invention of prismatic powder, and it is now, in the light of later experiments in Europe, safe to say that with liberal appropriations to conduct experiments with them we should have maintained our lead over European nations in ordnance.

We were certainly well in advance in powder manufacture under the direction of the Bureau of Ordnance up to 1874, when the money for further experiments was not forth-coming, and the Italians came to the fore with their Fossano powder, while the useful development of the Rodman prismatic powder by the Germans and English continued. In England, while the authorities cling to the depraved system of studded projectiles with the same illiberal tenacity that led them to give up further trials with breech loaders, and rest their cause upon muzzle loading guns; we yet see that they are using a gas check to prevent the rush of gas along the groove with its consequent waste of power

and scoring up of the gun. They have had great trouble in keeping these gas checks from flying wild as the projectiles leave the gun, their tendency to whirl to the left of the line of fire being decidely objectionable. It seems strange that the gas check which is now of so much trouble to them, and only produces one effect in the gun, should not be used as is ours to accomplish the rotary motion as well. Even their grooves are getting quite numerous, as we find in the projectiles for the 38, 35 and 25 ton guns nine rows of studs. It takes surprisingly little force simply to rotate a projectile, and I venture to say one of our shells would be rotated in these guns by the mere expansion of the band and without studs. In a breech loading gun the same shell may be used, but here we have a chance to prevent the shell's sliding forward in the bore, by depression of gun or shock in running out, by having a slightly enlarged chamber with a flare or shoulder to the band, or we may use a forced projectile such as that of the 3 inch B. L. H. There are many varieties of forced projectiles of greater or less merit. A devise used for rotating at the recent experiments at Meppen was essentially that patented in England by Blakely, and consists of copper wires with protruding semi-circular section, forced into grooves at the rear end of the shell, with one or more for centering towards the forward end of cylinder. That used by Col. Crispin at Sandy Hook in the 8 inch B. L. R., has a band like that for projectiles for the M. L. R., and except that at the extreme rear it has a very slight shoulder. A few blows with a hammer to flare out the lip would accomplish the same thing and take away the forcing character. A forced projectile is used in the 3 inch B. L. H., the band being well forward towards the center of gravity, and to prevent ballotting a centering band has to be used at the rear. This balloting of elongated projectiles is a subject deserving of a good deal of attention, as it pounds on and scores up the bore besides giving an imperfect flight—it may also to a certain extent act in a wedging manner. From experiments made in this country, and notably from the proof firing at Sandy Hook, it would seem that projectiles efficiently rotated from the rear, and where, as in the Butler and Parrott, the windage is not entirely suppressed, are free from balloting and the question naturally comes up why this should be so. The owners of the Butler patent claim that at discharge the quick motion of rotation, caused by the expansion of gases and the driving forward of the projectile, throws the shell up into the axis of the bore and spins it after the manner of the gyroscope, at the same time windage not being entirely suppressed, the gases at great pressure

(to which the mere weight of the shell is as nothing) surround it and keep it up. However this may be, judging from the flight of this projectile, balloting does not take place; yet in the case of soft coated projectiles where the band shows rifle motion to have been well taken up, the inference from a fluttering flight is, length of shell and pitch of rifling being good, that there has been balloting.

There is now being constructed at South Boston, under my inspection, and it is nearing completion, a 9 inch B. L. R. converted from a 10 inch Parrott, by inserting a jacketed steel tube from the rear.

The long inner tube is made of very low ductile steel, being in fact homogeneous iron rather than steel, and has walls two inches in thickness, while the steel jacket is considerably higher in carbon, giving it greater tensile strength and elastic limit. A shallow thread on the jacket keeps the tube in from the rear and a muzzle collar secures the front end. The breech mechanism is the slotted screw principle, and although the breech plug could be easily withdrawn by handles as is the plug of the 80 pdr. B. L. R., still, on the Bureau principle of working up on smaller things the attachments that will be needed on larger, a quick pitch screw in the box of the plug tray works the plug in and out, while the plug is turned the 60° necessary to lock and unlock it by double gearing. The Broadwell ring is used in this gun, in preference to the cup gas check, to allow pressure gauges to be set into the nose plate of the breech plug, as this gun is likely to be used for testing powder for rifled guns. The old reinforce band is left on over the breech, and, to compensate for throwing forward the center of gravity and to retain a breech preponderance, the old trunnions have been cut off and a cast iron trunnion band, with center of trunnions three inches forward of old center, shrunk on. This band is not a strengthening reinforce, but merely a strap to hang the gun in, yet it has the effect of rendering the gun much more shapely.

Another gun is to be made entirely of steel at the same works, the steel being furnished by the Nashua steel works. It is to be a 6 inch B. L. with an enlarged chamber of 8 inches, and very long. The long tube or gun proper will be of milder steel than the jacket, breech band and reinforce rings, which are to be of very high tensile strength and elasticity. This gun will doubtless reproduce the great velocities obtained by Armstrong with his chambered gun of this caliber.

It is too often said by unthinking people that it is needless to go on with experiments which are necessarily so expensive, and to build guns that will, in all probability, be out of date in a very few years,

while by awaiting the results of those made by foreign powers we can get our information at no expense to ourselves; that it will be time to start on the manufacture of ordnance when the need for it arises; that the resources of this country are so great that a navy can spring into being at a moment's warning. We all know how very visionary such reliances are, how wide of the truth such expectations would be in reality. We have no plant where a steel gun of any considerable size could be made inside of many months, and, never having made one, we have no steel makers of experience in that particular branch. This very 9 inch B. L. R., spoken of above, has been under construction for nearly two years, and when finished will be but a make-shift. Now is the time when we should be learning, as well by failures as by successes, should be training skilled labor and should be increasing our facilities of manufacture.

Nor may the time be very far distant when we shall find ourselves engaged in a foreign war. As long as the Munroe doctrine is cherished so universally and so dearly by the American heart, just so long are we liable to be engaged in a foreign war at any time. The present question of an inter-oceanic canal may at any moment involve us in controversies with foreign powers. The minute it becomes for their interest to oppose or molest us for reason of this canal, in the way of free trade or otherwise, we are likely to find out that our inability to back up our Monroe doctrine is only too well known to them. They know how far we could enforce our dictations as to European intervention in the affairs of nations of the western continent. In the advent of such a war at what a disadvantage we should be? Our forts with their present armament would leave our maritime cities at the mercy of a powerful enemy; torpedo defence, however admirable the system, however wisely planned or gallantly executed, can avail little except in combination with powerful ordnance. On the sea the same humiliating spectacle would be presented: a few cruising vessels, the fastest and luckiest of which might survive for a time and carry on a maritime guerilla warfare, would soon have no home ports open to them for protection or repair. Many desperate and gallant things would doubtless be done by the personnel of the Navy—and this we are warranted in predicting by reference to the past history of the navy—but can a great nation afford to wage war by a series of forlorn hopes? Is it policy? Will it pay?

THE CHAIRMAN. I should like to ask the lecturer what, in his opinion, is the best gun for the navy.

Lieut. LYON. In the gun of the future we are as sure to come to a breech loader as we were to come to the same thing in small arms. As to the material of which it will be made, I should say that it would be of steel, as that metal is the strongest and most elastic one suitable for making guns that we know of. There is an element of uncertainty in steel forgings of large size that must of course be eliminated if possible, and for this reason, as well as for the practical knowledge to be gained by our steel workers and ordnance officers, we should now be making experiments. Taking the Krupp as the best type of large steel guns, we still know that quite a number of them have burst in service. In case of war, we can make very excellent guns on the Palliser system, casting the casings of such dimensions and length as we like, and not being limited, as now, by the form of old smooth bore guns. There are still advocates of cast iron simply for rifled guns, and their claim is that in the few experimental guns of that kind experimented with in this country, where the cast iron is exceptionally good, such violent powder and such vicious systems of rifling and projectiles were used as not to give the guns an honest trial. There were occasional pressures withstood of one hundred thousands, one hundred and fifty thousands, and even two hundred thousands of pounds, which would seem sufficient to burst any gun. I think that, in case of an emergency, cast iron rifled guns, even with enlarged chambers, could be used with our system of projectiles, and good powder, and develop a very good life. The tensile strength of the iron in the casing of the 12.25 inch gun now at Sandy Hook is over thirty three thousand pounds per sq. inch, and that can well be guaranteed for future guns, with a good chance of getting it higher, besides which we know in this metal how much to trust, while with large steel guns so far made, the probabilities are that there are parts where the metal of the gun is not up to that in the test specimens.

THE CHAIRMAN. It was my experience during the war, and doubtless other officers present had the same experience, that the distrust of cast iron rifles became very great, and I should feel very sorry to see that form of metal introduced again without much experiment.

Commodore RANSOM. What is the relative strength of cast iron and cast steel gun metal?

Lieut. LYON. We may take the strength of good gun iron as thirty-three thousand pounds per sq. inch. I do not know of any steel used for guns that is over one hundred thousand pounds per square inch tensile strength. A vastly greater strength for steel can be obtained, but it becomes too brittle for guns. In the jacket for the tube of a steel gun now ordered from the South Boston Iron Co., the tensile strength is expected to come up to about that figure,—one hundred thousand pounds.

Commanner SICARD. While it is true that steel specimens sometimes show a tensile strength of over two hundred thousand pounds per square inch, it must be remembered that such steel is very "high" and "short"; consequently unfit for use in the construction of cannon, owing to its want of extensibility;—especially would it be unsuitable for those parts contiguous to the bore. The effect of vibratory strain is disastrous to short metals, and it is found much better, in practice, to reduce the elastic and tensile limits of the steel, and increase its extensibility; as the molecules of the metal are then in such a condition with regard to each other that they may be somewhat separated or reärranged under strain without cracks being initiated. Personally, I am of opinion that in introducing steel guns we should not, at first, strive for very high tensile limits, but be content with low and soft steels, in which the margin of safety is large. This remark has reference to the body of the gun, as the outer jacket may be made "higher" without objection. For guns of moderate caliber, from sixty to eighty thousand pounds seems a good figure to start on with an extensibility (at failure) of about 20 per cent. The extensibility

of soft steel measured after fracture is much greater than that shown at the "failure" of the metal, which latter point is arrived at when the specimen under test no longer supports the maximum weight, but stretches as the weights are removed from the steelyards of the testing machine. After passing this point the "life" of the metal may be said to be gone.

Lieut. LYON. The steel ingots which I am about to cast at the Norway Iron Works for short tubes for 60 B. L. R.s, are to have, when forged, a tensile strength of eighty thousand pounds, an elastic limit of about thirty five thousand pounds, and an elongation at failure of about 17 per cent.

Commander SICARD. It will be safest at first (as I before remarked) to make our steel guns rather mild. In the introduction of the new armament we do not wish to have any accidents, and in fairly low steel there is safety. After manufacturers become accustomed to the production of gun steel we may proceed to harden the metal as endurance may require, though if it should happen that the bores of the soft guns wear too fast, they can be tubed. I quite agree with Lieut. Lyon that in some respects the Parrott gun was far in advance of its time, notably in length of bore and in the twist of the rifling. The expansion system, also, though crude, was a step in the right direction.

Lieut. STRONG. What is the relative strength of the 8 inch converted rifle and Krupp guns of about the same caliber?

Lieut. LYON. I do not know the relative strength, but it can be calculated, always supposing that the steel is homogeneous and up to the qualities of the test specimens; but, as I said before, we have from experience always an element of doubt in large masses of steel as to its homogeneity. The doubt in the Palliser tube would be as to a defective weld, which would affect the longitudinal strength only of the tube. This latter gun would not, in case of rupture, burst explosively.

Commander SICARD. A comparison of the strength of the systems could be made if we knew the mechanical qualities of the metal in each case, and the amount of squeeze with which the Krupp rings are placed, but after all there would be a wide margin of uncertainty, owing to unavoidable errors in manufacture, the varying qualities of large masses of metal, and the uncertainty as to the exact amount of squeeze that has really been obtained by the placing of the rings. It is a well known fact that cracks have developed in many steel tubes, and have often resulted in the failure of the piece, while in other cases experimental guns have supported a very large number of rounds, long after the walls of the bore have become covered with cracks and fissures, the exterior of the piece badly swollen, and the rings separated by the elongation of the piece. There is a want of uniformity in the qualities of current production from the steel works that will for the present necessitate the use of comparatively soft ingots.

Commodore RANSOM. Can we arrive at the exact tensile strength required?

Commander SICARD. It is not possible in the present state of manufacture to arrive exactly at the limits required, the efforts of the gun steel makers being still tentative. The furnace is usually under the direction of an experienced practical man, with whom should be associated a scientific metallurgist who is experienced in chemical analysis, etc. These men working together on sufficiently large orders to stimulate their ambition would doubtless make continual improvement in the product of their works.

THE CHAIRMAN. I am sure all present will agree with me in returning thanks to Lieut. Lyon for his interesting and able paper.

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COM'DR E. O. MATTHEWS U. S. N., in the chair.

THE TRAINING OF SEAMEN.

BY LT.-COMDR. F. E. CHADWICK, U. S. N.

MR. CHAIRMAN AND GENTLEMEN:—

I can only hope to give a slight *résumé* of the methods pursued abroad in training men for the navy. But I shall, at least be able to show how much more attention has been given to the subject in nationalities which we have usually looked upon as far behind us in educational subjects and methods, than amongst ourselves. While we have admittedly, by almost all, been foremost in the education of our officers, both as to the time of the establishment of a system of higher education, and as to the extent of the education itself, we have been more than backward in doing anything for the enlisted men of the service; any real efforts in this latter direction being made long after the establishment of complete systems by the greater naval powers of Europe. While England, France, Italy and Germany were all making radical changes in their training and treatment of men, we, for many years of the time these changes have been progressing, were almost perfectly supine and careless, depending for our supply of those who were to uphold the honor of the flag, upon the waifs of every nation which drifted to our shores. Nor did we only wait for them to come; we took them on board in every foreign port, until the crew of an American man-of-war represented almost every tongue and color.

The apprentice system, in existence between 1865 and 1870, gave us many excellent men, some of whom still remain with us, and who are amongst the best we now have. This system was however handicapped by the inducements held out to parents to send their sons on board ship with the prospect of having them enter the Naval Academy; a certain number of entries from the training ship being allowed yearly. The consequence naturally was that a large number of the

boys received on board came with no intention of becoming sailors, and the true aim and *raison d'etre* of the system was lost sight of: it naturally died of inanition. From that time until 1875 when the Minnesota was commissioned as a training ship we had no other dependence than upon the same class we enlisted during and after the civil war.

England, to whom the navy is an absolute necessity of national existence, founded her present training system in 1862. It has passed through several phases, but has finally settled into a uniform method of training in which, it seems to me, there are few things to improve.

There are in the whole service afloat between eighteen and nineteen thousand blue jackets out of the about thirty thousand enlisted men (exclusive of boys) in the service; nearly all of the former have been passed through the training ships. To keep up this number between twenty-three and twenty-seven hundred boys must be trained annually, this number being the waste in the blue-jacket class from death, desertion, and expiration of enlistment. These boys are gathered from every part of Great Britain by recruiting sergeants at frequent points, and also by means of the coast guard and other ships on board of which boys can be received and examined, and from which they can be forwarded to one of the training ships. The Navy, always popular, has of late years, amongst the people at large, become greatly more so, so that no difficulty whatever is found in getting a full supply of excellent material; the supply indeed is much greater than the demand, so that the boys received are really picked boys. To enter, the boy must be between 15 and 16½ years of age, must be of good physique and must know how to read and write. Stress is also laid upon character; persons who have been in reformatories or who have been committed by a magistrate not being received. He passes a preliminary examination at his recruiting station and a final and more rigorous one when he arrives on board ship.

To receive this large number (twenty-four hundred being the last year's allowance of new entries) there are five line-of-battle ships, two of which are stationed at Devonport, one at Portsmouth, one at Portland and the other at Falmouth in Cornwall. Each of these ships can accommodate comfortably about seven hundred boys; the Impregnable however at Devonport had on board at the time of my visit a few over nine hundred, a greater number than a ship of this kind should receive. In all the ships there was a total of about thirty-one hundred boys.

The officers in command are of the grade of Commander, with the exception of the captain of the Impregnable, who was a captain high on the list, and who has, under the Admiralty, complete control of the entire system; his place is thus by no means a sinecure. The staff of officers comprises but three lieutenants, but the want of officers is made up by a large force of trained men who are employed in the details of seamanship and gunnery drills. The interior arrangements of the ships are made with regard to convenience only, bath-rooms, study, and model rooms are bulk-headed off without reference to the appearance of the ships as men of war; they are all fully supplied with reduced spars; have from twenty-five to thirty-seven boats each, and have on board a great variety of useful models. To each ship is attached a brig and also a hulk, which latter is used for a variety of purposes. The one connected with the Impregnable is an old frigate called the Circe, which is moored near by: she serves as a store ship, a carpenter shop, where are educated a number of boys as carpenters, and above all is used as a receptacle for newly entered boys where they are taken in hand by the ship's corporals and are gotten into shape before going on board the parent ship. During the week they are on board this hulk, they are provided with bedding and clothing belonging to the government. In the meantime their new clothing is taken in charge by the corporals and plainly marked, and the boys are taught to stow their bags and hammocks. At the end of the week they are transferred with their kit in perfect condition.

The outfit allowed amounts to the sum of $25 for clothing and $5 for bedding, so that the boys enter untrammelled by debt.

The schooling is limited in extent, but within the limits is very thorough. Nearly all the boys are excellent penmen and good readers, and cipherers. In arithmetic they are taken through decimals: elementary geography is also taught. The instructors, who are under the chaplain, who holds likewise the position of Naval instructor, are all either Naval schoolmasters or pupil teachers from Greenwich Hospital School, who are preparing as schoolmasters: they are men admirably trained for the purpose, and I know nowhere a more efficient and well prepared body. I cannot speak too highly of the training and zeal of these men; both are shown most fully in the excellent results attained in the schools of the training ships.

The practical training consists in learning all the work and duties of the sailor. The models supplied are for use, and not for show only, as much is done with these as can well be done with such means; and

a great deal can be done if such means is properly utilized. Daily exercises of spars and sails take place, except in the winter months; handling boats under sails and oars is frequent; cutlass drill, infantry, gymnastics (which is taught by a non-commissioned officer of marines), truck gun exercise, and swimming, are all thoroughly well taught. All these exercises, excepting those of sails and spars, are under the immediate direction of the trained men or petty officers, who are detailed as instructors in seamanship.

Each of the lieutenants on board has charge of certain subjects, but the men who do the instruction work under them are a class absolutely unknown in our service, and whose existence in that of England is one of the greatest evidences of the benefit of their system. These men are almost exactly analogous, in the authority which they exert, to the non-commissioned officers of the army. While we have always had a large number of men, with large pay, whom we have designated petty officers, we have never, as a rule, had any who could be really looked to for an adequate return for the benefits they have received: They are often not even leading men. It has been until lately the custom to make and break them at the humor of the moment; they have existed, and to a large extent do exist, as petty officers in name only. It appears to me that this is one of the most crying evils of our service. Why should we have coxswains who are not capable of commanding and taking care of a boat's crew? Why should we find it necessary, in sending a boat ashore, to send an officer in charge of the coxswain, who, as it now stands, is paid a large extra sum for doing the easiest part of the labor in the boat,—the handling of the helm,—without having any special fitness for it? We can only get such a class as these I speak of in the English navy by training men who are equal to the task of making themselves obeyed. Obedience to-day is not given to superior physique only; it is given much more to mental and moral superiority,—to the man who knows how to command himself; who knows the extent of his authority, and has the mental and moral force equal to exerting that authority. The truth is, we have had no such self-respecting class from which to draw. We must cultivate such a one, as all other civilized nations have done; must make the tenure of their position stable, transferring them from ship to ship with their rank. In the English navy continuous service petty officers carry their ratings with them, it being left open to the captain of the ship they join to alter the specific rating to that best suited to their abilities; but no worse positions, as regards pay and emoluments, can be given them

than those which they had previously held. Our own regulations provide that a continuous service man who is distinguished for obedience and sobriety, and is proficient in seamanship and gunnery, may, on the expiration of his enlistment, receive a good-conduct badge; after he has received three such badges under three successive reënlistments, he shall, if qualified, be enlisted as a petty officer, and hold this rating during subsequent enlistments: nor can he be reduced to a lower rating, excepting by sentence of court martial. This is a great step in the right direction: the French, however, whose system in this regard will be mentioned further on, seem to me to have solved this question almost perfectly.

To return, however, to the boys themselves. The scholastic and practical training on board the parent ship lasts about a twelvemonth; after which is given a six (6) weeks' sea training in the brigs, and finally a ten (10) weeks course in gunnery on board the gunnery ship, after which the boy is ready for service.

During this time, in addition to schooling and training, he has had great advantages; kind treatment; a discipline in cleanliness and order; plenty of leave and liberty; access to a good library on board;—all tending to reform boys of bad disposition, and to make excellent men of the well-disposed. Great care is taken to amuse and instruct, outside of the regular routine, a large sum being allowed, which is mainly used for the purchase of games, bats, balls, etc., and for such books and papers as boyish taste demands. The course is not all work, and, so far as I can see, the result is general contentment. Fifty-three days leave are allowed during the year, divided into two periods of sixteen days each, and one of twenty-one. One afternoon a week is set aside for general liberty, and all, whose relatives live near enough to the ship, are allowed to go home on Sunday. Punishment is light, and offences few. The whole method of discipline is humanitarian: there are as few restraints and punishments as possible, and, altogether, I cannot imagine a better school in which to bring up a young man of this class.

The brigs, which are each of about four hundred tons, and one of which is attached to each ship, are under way as much as possible between April and October. Of course the six weeks training allowed to each boy is altogether insufficient to make much of a sailor of him; but with the other twelve months drill it goes far towards it, and the boy is turned into active service with his brain alert to receive anything which comes in his way to learn. After all, education, in its true sense, is not so much the giving of information as it is the quickening of the

perceptive powers of the brain, awakening it to receive new ideas and thoughts; and this is a good deal the result of the methods employed in these training ships. Little advance towards the true idea of education has been made by an instructor until he learns to discriminate between instruction and education. One may receive all the facts in the world, but until he is taught to reason about what he has seen and heard, his education has been naught. Much is sometimes said about the non-necessity of certain studies at the Naval Academy; the applicability of *this* is not seen, or the uselessness of *that* is held up to derision. The scoffer does not understand that the broadening and deepening of the mental powers is what is aimed at, and not merely the cramming of the mind with certain facts, many of which may be obsolete. Naval science is so advancing and always moving that it is much better to have men who are able to take in and reason about that which is now happening, than to have them simply conversant with the practice of the past. Of course we strive to have both. We are too liable to become the slaves of routine in the navy, in any case: we lack adaptability to new methods, and are not apt to think well of new things, because they are not such as we have known of old. Conservatism is good in its way, but too much of it is ruinous.

In the same way, we want to train our men to use their brains to some purpose; we no longer want the machine of the past, who never had a reason for action in his head, and never thought of looking for one. The ten weeks of gunnery on board the gunnery ships is thought by many to be too long. It would be better, too, if this were made a part of the course on board the training ship proper, or in a vessel entirely under the control of the commander of this ship. During the first twelve months the boys are given nothing but an exercise of truck guns, having target firing on Saturday mornings. As there are still between seven and eight hundred of this class of guns afloat in actual service in the English navy, this drill, besides being a good disciplinary one, is not lost.

Much more attention is given to small arms than with us, and the British sailor is turned out a very respectable soldier. For one, I am a strong advocate of much infantry drill, if it is properly given. I cannot see how it can injure the boy or man in any way as a sailor, and it affords a convenient and pleasant variety from sail-drill: it need never be so much used as to conflict with the latter; there is no better means of discipline; it affords a good setting-up; makes a handier and more capable man: so that I regard it altogether an indispensable

adjunct of modern training. There is no reason why a ship's company of five hundred men should not be able to land at any time a battalion of three hundred, perfectly equipped and ready to take the field. The sailor is so much more a man of adaptability than the soldier that I see no objection to including the work of the latter in that of the former, when occasion requires. The universal praise accorded the English blue-jackets in the late Zulu campaign says more than any argument on this subject: where the soldier was helpless the sailor was full of expedients; he was always sheltered; always had food; was always in good fighting trim. I think it would be far wiser that instead of decrying efforts to extend our usefulness, saying that this and that does not lie in our way, we should take pride in being able to do so much.

There are trained on board these ships a number of signal boys, sufficient to answer the demands of the service; and lately the experiment of educating carpenters has been tried: this latter has not been long enough in operation to judge of its effectiveness. Bandsmen and buglemen are also here trained, giving a uniformity which we sadly lack. The bugle is almost entirely used for calls, and the men of the entire fleet are accustomed from the earliest years of their service to the same notes: the ceaseless variations arising from the whims of captains or executives, or from the taste of the bandmasters, are avoided, and one's ears are not afflicted with the unmelodious morsels from popular airs, so general with us.

The Greenwich Hospital school, which serves, under its new regime, as a feeder to the extent of two hundred boys yearly to the training ships, supports a complement of one thousand boys, the sons of seamen and marines who are, or who have been, in the service. It is immensely valuable as furnishing the ship's stewards' boys, and the schoolmasters of the service alone, and the additional two hundred who are supplied yearly to the training ships are amongst the best received. They immediately take the highest stand, as their previous education at Greenwich has given them really almost all that a boy can learn in these ships; and, in time, if education and training tell at all, they must furnish, in a great degree, the petty officers of the navy. The more institutions of the kind there are in any land, the better; no more wise and noble charity could be than this, which takes the sons of those men who, above all others, are from unavoidable circumstances, unable to look after their children, and educates them for a useful service. Being on the half-time system, each boy acquires a trade of some kind, the greatest number being tailors, or garment-makers of some sort.

We can hardly expect anything in this country analogous to this very notable school, for many years to come, as our sailors have so few ties to the service as yet, that their children do not fall under government protection, though I see no reason why in time they should not be cared for to some degree.

The training-ships for boys are somewhat supplemented by the employment of a sailing frigate for additional training of young ordinary seamen, and on board of which there are usually about two hundred, taken from those on board the depot ships who have not been drafted into service. The unfortunate Eurydice was a ship of this class: her place has been taken by the Atalanta, a small ship, of about a thousand tons, which during last year was cruising about Madeira, and in the vicinity of the British coasts. It is intended in time to have sufficient ships to take on board all the young ordinary seamen for the time being otherwise unemployed. As nearly eight thousand out of the nineteen thousand blue-jackets are employed in harbor ships, there is certainly opportunity for this extra drill at times.

In the question of training, the English have one great advantage over ourselves in the long time enlistment. Their boys are taken to serve for ten years from the age of eighteen, and no continuous service man is enlisted for less than ten. Of course the first time of the boy extends on an average over a space of twelve years, so that an exceptionally long time might be expended in training and there would still be a long remainder for useful service. With the great number which they are obliged to have in order to furnish all the demands of the service, the question of a year longer in the training ships proper, becomes rather more one of expense than of expediency. The sum already yearly expended is over five hundred thousand dollars, and this would be much more than doubled if the time were so extended. Take it all in all they have taken a good average both as respects the time at which a boy is taken in hand, and the time for which he is trained. Though nominally this latter period is for a year, if time is allowed it extends through sixteen months, divided as I before said between twelve in the training ship, six weeks in the brig, and ten in the Gunnery ship. Sixteen appears by almost universal consent to be the best age at which a boy can be received. So many questions are included in training that this of age is difficult to decide; impressibility, physique, mental power and previous education must all be considered. Much can be said for almost any time between thirteen and eighteen, so that instead of adducing arguments, it is better to take the opinions of experience.

These, as given before a parliamentary commission by ship owners, ship-masters, and naval men, were almost unanimously in favor of not taking, as an average, boys under fifteen or sixteen. Of course much depends upon the time for which it is intended to keep the boy under training. If expense and time are unlimited, no doubt the boy taken at fourteen and trained carefully for three or four years will make a better man than one whose education and training have lasted but half this. With the English, however, the question of expense would be almost insurmountable; with ourselves both that of expense and that of having comparatively but a small part of the boys' enlistments available for active service, unless we could limit our entries to very young boys, in which case expense alone need be considered.

The training given at any time to men of good character and capacity in the Gunnery ships is of great importance. There are at present in the English Navy about ten thousand men who are trained men or seamen gunners. The course on board the Excellent and Cambridge is not limited to any particular time; a man if zealous and intelligent, sometimes being kept several years, unless there is a call for his services afloat. They learn on board these ships every thing they need to know respecting the arms they handle or the ammunition they use. The best of the men turned out are an exceedingly good class, able to act as drill officers in almost any of the subordinate capacities on board ship. There is also a torpedo school in which many men are instructed in the use of torpedoes. We have not as yet done anything in this direction with the enlisted men of the service, but it must naturally come with a perfecting of our training system.

There is one other bit of training which should be mentioned, that of ships' cooks in the school of cookery on board the flag ship at Portsmouth, where a training of three months is necessary before a man can obtain even the rating of cook's mate. Seamen have been a class much sinned against in this regard, less care even being taken as to the man who cooks his food than as to the food itself. A discussion of this subject however, of ships' rations and of the men who cook them would extend into too wide a one for the time we have. I can only say that I think there is no better field for improvement, and that it is one which should have been undertaken long since. The rations of the boys under training in the English Navy, and their hours of meals, are all that could be desired, being far superior to those of the Navy at large, or to those of any other service with which I am conversant. This is as it should be: man as well as other animals is made to great

extent by the amount and quality of food he eats, and it is all important that in these growing years, a boy, to have a sound physique for the strain and wear of the navy in after years, should have as much healthful food as he can assimilate.

One result of the present system of the English has been to give them exceptionally young crews. All boys are promoted to be ordinary seamen, or ordinary seamen second class, at eighteen. They begin then really upon their first term of enlistment, which is for ten years, or until twenty-eight. By serving another such term, or until they are thirty-eight, they can retire with a pension of a shilling a day or more. These men rarely have any difficulty in obtaining employment elsewhere, if they wish to serve no longer in the navy; the character of the seamen of the fleet standing so exceptionally well that they are readily taken. Many men, during their terms of service, are transferred from the navy, upon their own application, to the coast guard, an institution which all of us, I think, must regret not to have here. If applied to our life saving service, it would give us in time a reserve of two or three thousand men at all times available for emergencies and at all times ready in respect to drill and instruction.

The English have nine coast guard districts which were instituted primarily for revenue protection, each of which is under the charge of the Captain of the first reserve ship attached to that district. The districts are subdivided in seventy-three divisions, commanded by inspecting officers who are commanders or lieutenants in the Navy. These divisions are again subdivided into two hundred and thirty stations, each in charge of a chief officer (about equal in rank to a warrant officer,) the whole is under the charge of an admiral, whose head quarters are in London. At the stations along the coast one sees groups of comfortable cottages which are the residences of the men of the station, in which they live with families. No part of the coast is out of the view of the coast-guardsman who is always at hand to give aid to sufferers, or to telegraph information to head-quarters. The nine coast-guard ships called the first reserve, all of which are large iron-clads, and which are for most of the time under reduced complements, gather together yearly the men of their district for a summer's cruise of six to eight weeks for practice and discipline, and cruise in squadron. The cruisers used for revenue protection are about forty small vessels varying from one hundred to five hundred tons.

I do not think I need specially point out the benefits of such a sys-

tem to our own service, which would tend to bring it more in contact with the people; give it an employment at home; afford a refuge for the most deserving men; give our life-saving service a strictly military organization, such as it ought to have, and furnish, as I said before, a reserve of disciplined and trained men sufficient on the occurrence of an emergency to man a squadron of eight or ten ships.

The whole British system is now thoroughly homogeneous—practically all the blue-jackets are passed through the same training and are turned out as much alike as possible. Their practice of having the system under one head and allowing no chance for the exercise of individual whims or fancies cannot be too much commended. The captain of the Impregnable is commodore of the squadron, if it may be so called, of the five line-of-battle ships and their adjuncts. Every thing pertaining to the system is referable to him, there being no question which does not come under his cognizance; he is answerable to the Admiralty alone. There can be no real success in such a scheme without such a subordination to one head. Having determined upon the methods to be pursued, one officer should be vested with the general executive authority. It is better to have one method with some faults than to have the conflicting schemes of individuals, though each in itself may be more perfect than the one general scheme. The English, as I say, have determined in favor of one head and absolute uniformity, and judging from the general success of their system, we should do well to follow suit.

I cannot, in the time allotted, do more than merely glance at what is doing in Great Britain in training for the merchant service. There are eighteen large ships, permanently moored, so employed, but as the aims and results are so different from those of the Navy, one can hardly institute a comparison. Their material, to begin with, is vastly inferior to that of the Navy—much or most indeed being made up of homeless and destitute boys who are sent to these ships as to a species of reformatory. There can be furnished in this way but a very small percentage of the men needed; sixteen thousand a year being the estimated waste among the two hundred thousand sailors who man the British Merchant ships. We no doubt in this country must establish schools when our commerce revives. Schools for officers will then be an absolute necessity, as we now have far too small a merchant fleet to rear any number. The St. Mary's is now rendering a good service, worthy of imitation in other ports.

To pass to France.—We find here a complete change of methods,

both as to recruiting and training. Whereas the English aim at producing a good mean throughout their service, the French effort is mainly directed towards specialties. Seamen-gunners, small-arm men, quarter-masters, signal men and topmen all receive a special training from the time of entry. In the English service work of this kind is, wisely, I think, undertaken later on, and, as a rule, only in the case of those who show special fitness.

Nearly all the men who man the French Navy are taken from those enrolled in the *Inscription Maritime.* These men are sent to the Barracks, or *Divisions*, established at each of the five military ports, where they await detail for service. While here, selections are made for the various branches of the service, of men who may seem best adapted, and these men are sent for a four or six months course on board the Bretagne, a magnificent specimen of the old three decker, which had on board, last August, a complement of over sixteen hundred persons. The total on board, of men selected for specialties, was thirteen hundred and seventy eight, divided between topmen, seamen-gunners, *fusiliers* or small-arm men, and men of the quarter-master class. After passing these four or six months on board this ship, with frequent exercises underway, in a small frigate attached to her as a tender, and to which one division is sent weekly as a crew, these *apprentis marins* are forwarded to the various points where the special schools are established for further training, undergoing there a specific course laid down by the Ministry of Marine—; to the gunnery school at Toulon; to the school of Infantry and small-arms at Lorient; to the school for top-men, quarter-masters and signal-men in two cruising frigates. A portion of the apprentices on board the Bretagne are supplied from the Austerlitz, a line-of-battle ship stationed at Brest, and on board of which boys are taken for a two or three years course. The number so supplied, however, is limited and can have no great effect upon the service at large, but eight hundred being the ship's complement, so that not more than three hundred are yearly supplied in this way. So far as it goes the method is good, as these boys are kept for a long time under good discipline and training, having the advantages of exercise afloat in the tender to the Austerlitz and leaving the ship altogether better prepared to rise in the service than are the others on board the Bretagne, who have been taken directly from the various depots.

At Brest too is a school similar to the Greenwich Hospital school, which has in it four hundred boys, taken generally at a much younger age than those at Greenwich. It is certainly a most meritorious in-

stitution, and excellently well managed, but the boys were by no means up to those of Greenwich in physique or intelligence, nor of course could the yearly supply by any means equal that from the latter.

The French also educate their coast pilots and their musicians, instruct a certain number in the use of torpedoes, educate their firemen, and turn out in many ways a most superior set of men. The only criticism I can make is upon the methods themselves, and not upon the manner in which they are carried out. I do not think it consonant with our ideas to differentiate duties to such an extent, and I think, as I believe most of you will also think, that it is better to have a good general level of homogeneous material than to have more highly trained separate organizations which must have among them many discordant and inharmonious elements.

The system of promotion amongst the men in the French navy is most excellent; in all the corps of specialists, *brĕvets* or certificates are given after passing an established examination, which entitle the holders to precedence of selection for petty officers' positions in their especial branches. These examinations are held by regularly constituted boards of officers; four officers usually being upon each. In most cases there is a fixed schedule of questions published by the Ministry of Marine, covering the entire subject. Certain percentages of marks are necessary to establish the claim of the applicant for a first, second or third class certificate. There can be, to my mind, no better way of selecting petty officers; the examinations are rigorous and before such boards that they must be fair, and the man's rank really counts for something.

In this we have an excellent model for ourselves. No organization, and certainly no military organization, can be successfully and happily organized with such sudden and immense differences in the status and obligations of its *personnel* as in our own. I have always thought, and after extended observation still more think, that we have been more successful in educating officers than has been any other nationality; but here we stop,—an immense break takes place, which must be bridged over. The boatswain's mate, the coxswain, the captain of the top, must be men equal to, and ready to assume certain responsibilities. We are now looking forward to a change in the attitude of the country on the naval question, and in considering the questions of re-organization, we must deliberately face and recognize our present disabilities, not only in *materiel* but in *personnel.*

To impress upon you the particularity with which the French enter into this question of education, I hope you will allow a re-enumeration of the schools in use. The *Establissement des Pupilles,* for sons of seafaring men, in which there are four hundred boys; the training ship Austerlitz, which has a complement of eight hundred boys, who stay on board two or three years, or until they are sixteen, and who are transferred to the Bretagne for further instruction; the Bretagne, the training ship for novices, (the greater portion of whom, of course, come from selections made in the *Divisions,*) and which serves as an intermediary for the purpose of breaking in, so to speak, those destined for specialties; all the preceding are at Brest: — the gunnery school at Toulon; the school of musketry at Lorient; the two cruising frigates for the instruction of topmen and quarter-masters; the school for coast pilots; the torpedo school at Ile d'Oleron, where seamen are also instructed, and, as in the other specialties, receive certificates of aptitude. Besides these there are others for firemen and machinists; for apprentices in dock-yards; for naval school-masters, etc.

The organization of the *Division* itself is one of the most praiseworthy of the many things to be praised in the French service. The men are here housed in comfortable barracks, instead of being crowded on board hulks and depot ships; with plenty of light and air, places for exercise, a good library, and a school for the instruction of all who fall below certain attainments in school-work. They are here subjected to a complete military organization and discipline; and, instead of deteriorating, as men crowded into receiving ships almost always must, they are, when drafted for active service, in a far better condition than at entry. This is a question which can hardly concern us much just now, but the time has been when I have known over two thousand men in a two-decker in a state of filth and disorganization painful to look back upon. Under the same circumstances we should have to undergo much the same thing again. Where have we, at our Navy Yards, receptacles for men, in any war emergency? The old liners in which we crowded the men during the rebellion are, with three exceptions, gone. Here in New York, fifteen hundred might be properly taken care of in our two receiving ships, but during the time they are on board in such numbers, there is no chance for adequate drill or discipline, and one could only look for a repetition of the experience of 1861–65. What can be thought of the preparations for emergencies at Norfolk, where we have one frigate as a receiving ship; at Philadelphia, where is an old sloop-of-war; at Boston, where is one line-of-battle ship? Both the

French and Germans employ barracks, and I met no officers in England who did not advocate the same.

The Germans have a most elaborate training for a limited number of boys, lasting through three years of alternate shore and sea-service. About four hundred are constantly under training, a sufficient number being thus supplied to furnish all demands for warrant and petty officers. As in almost everything else pertaining to educational methods, they enter into this with exceeding minuteness, no detail of professional knowledge being omitted. The scholastic training includes arithmetic, geography, history, music, and, in the case of a limited number who show themselves especially capable and clever, English.

From April to October the ships cruise; a month's leave is then granted, after which the boys are in barracks at Kiel or Wilhelmshaven, at which latter place is the gunnery school for the navy. In returning from sea the ships are dismantled and laid up for the winter by the boys themselves, and in the spring they also do the refitting. During the first year the new recruits do not leave the waters of the Baltic; but in succeeding years an extended cruise is taken, their training ships frequently visiting our own coasts. I have not space, of course, to enter into details regarding the system, but a most elaborate series of regulations has been published, entering minutely into the distribution of the time, both on board ship and at the barracks. While at the latter, infantry exercises form a prominent part of the course, and, besides the usual drills, long marches are taken. If any complaint can be made of this system, it is that of over-training.

Seeing what extreme attention is thus given to this subject by the greater foreign powers (I have not mentioned others, though most have systems quite as elaborate as these mentioned) it stands us in good stead to give it much more thought than has been usual with us in general. We now have our boys, and our ships in which to train them, but we still want a system. Everything heretofore has been tentative, and it is well that it should have been so, as it is not well to permanently fix such a thing hastily, In a multitude of councillors there is safety, and I think every naval officer ought, if he has any thoughts upon the question, to give them to the service.

We now have in commission four ships, the Minnesota, the Constitution,the Saratoga, and the Portsmouth, of which one only is cruising. I think it is well agreed, both in the Navy Department and out of it, that what is now doing in many ways is unsatisfactory, and many plans for a permanent systematizing of this part of the service have

been made. New London has lately been selected as a temporary head quarters, with the design of passing all recruits through the Minnesota which, as I understand it, is to be used as a depot ship, from which, after a certain period of training, boys are to be passed to cruising training ships. Now what shall be the duration of each of the periods of training and their extent?

I think there can hardly be two opinions upon the question of subordinating the system to one head, and, that being taken for granted, we will suppose that head to have command of the central station. At this center should be either two or three large ships, or, what is still better, barracks, sufficient to easily accommodate all the entries of the year. These ships or barracks should be fitted with all conveniences for study and for exercising; with models for teaching, with bath rooms, means for washing and drying clothes, etc. They should, if ships are used, no longer make a pretense of being men-of-war, but everything should be subordinated to the idea of making them first a comfortable and healthful shelter for their inmates, and, second, places for successfully carrying on study and the work incidental to teaching. Baths for teaching swimming should be provided, boats in plenty for exercising, and a small ship or brig for teaching practical seamanship under way. Here the boy should be kept from ten to fifteen months according to ability and physique, undergoing such training, scholastic and practical, as may be determined upon. The former, I think should be limited to the English elementary branches. Writing, spelling and arithmetic through decimals, in this time, can, if we have a properly trained body of school masters, be well and thoroughly taught; some geography and history should be added; plenty of sport should be allowed; gymnastics should be taught, and lectures on interesting subjects, illustrated by stereopticon views as much as possible, should be given, at least once a fortnight. Have as adjuncts at this station three or four small ships, such as the Saratoga, Portsmouth and Supply, to serve as cruising vessels. At intervals of four months let one of them take on board the boys who have undergone sufficient training at the station and cruise for six or eight months, having the crew of boys fit the ship for sea and dismantle her on her return. Book work, if there is any at all during this cruise, should be reduced to a minimum. We thus have given altogether about eighteen months training; amply sufficient, I think, to fit a bright boy of sixteen for a sailor's work. By the time he gets on board the sea-going man of war he would be (in the case of a boy

who enters at sixteen) quite old enough to do a man's duty. I think we make a great mistake in keeping these boys as boys after eighteen, any longer than we can avoid; it would be much better to follow the English practice and make them part of the general force of the service, not nursing them longer than we can help, but letting them take their chances with the other men.

I see no difficulty in the way of such a system as this I have sketched, turning out well. After it is once in good working order enough boys could be supplied in every four months to make up the cruising training ship's complement of about two hundred boys. It has been proposed that there should be stated times of entry, and a fixed time at which all the entries of the year should go to sea. I think this would be a great mistake, and one which would militate greatly against our success. We want an elastic system in which a boy can be entered at any time and be sent away at any time he is fitted to go, certain limits being settled upon of course, but the general idea is to give a year's training at the depot, and a six months' cruise afloat. The ships used for the latter service should go to sea and stay at sea as much as possible. Make these months a time of hard work—give the ship a limited number of selected men, not more than thirty or forty at farthest, which is more than the total number a merchant ship of like tonnage or size would carry. Immediately after the return from sea and the dismantling of their late ship, the boys should be distributed in service–and here comes an important consideration. Should these boys go as a small fraction of a ship's company? I say, emphatically, no. With the present class of men which we have in the service such a method is ruinous. Let them form the large majority of the crews of our smaller ships, and have the older hands of these ships, as much as possible, selected men. When our service is largely made up of the persons we are now training, our present plan will be a safe one but not until then. They are now looked upon by the old men as a privileged class, as interlopers, and are unquestionably ill treated by them, learning nothing as a rule from them but the vice natural to the class we have heretofore enlisted and being drawn by them into most of the offenses for which they have suffered court martial.

As to the place for this central station, I think everything points to Narragansett bay as being almost perfectly suited for such purposes; deep water, secure anchorage, a climate far milder than that of any other point near this latitude, its being the center of a great sea-faring population, are a union of advantages which no other place can show.

New London is in winter much colder; the river at the Navy Yard is much too small and narrow for exercises, and subject to being frozen over in winter; the station is at a considerable distance from the sound so that much time would be spent in going and coming by the small exercising vessels proposed, and lastly there is no room for gunnery practice. These are all disadvantages which militate much against it. Farther, and this should have great weight, the Torpedo station is at Newport. We must in time also train our men in the exercise and handling of torpedoes, and why not have the school at hand instead of far away?

Combined, too, with the central station should be the gunnery school of our boys and seamen so that there should be no necessity of a transfer to a new locality or to new officers for this important training. No place can be found more suitable for this than Narragansett Bay.

A question was lately asked in a Boston paper, "What are Naval officers doing for the improvement of the Navy?" This question of training is a most important improvement immediately at hand for all to work on. It is a thing which demands the deepest attention and consideration and it is a question largely in our hands to solve. It is one which may and should have noble results, and it will be a great shame to the Service at large and to ourselves individually if these results are not achieved.

The Chairman:—I am sure the meeting will join me in thanking Lieut. Comd'r Chadwick for his very excellent and interesting paper. I entirely agree with him that the training system should be under one head; the treatment of the boys should be mild, not sentimental, and that the details should be thoroughly carried out. The officers should sympathize with the aim of the system and should be able to enter into the spirit of the boys. It is a very appropriate time to agitate the question, now that the time for the re-organization and re-construction of the Navy seems at hand. I also think that when the boys are placed on board ship in service, they should form the greater part rather than the smaller part of the ship's company, or rather be sent as ordinary seamen, when they know more than those who are filling such places. This until the training system supplies the service.

Lieut. Wm. Mc Carty Little—I agree very thoroughly with the ideas and suggestions advanced by Lieut. Comd'r Chadwick; so much so that there is but little room for discussion. On board of the Minnesota the boys are shipped between the years of fifteen and eighteen. We have found, in developing the system of training in Seamanship and Gunnery, lamentable ignorance on the part of petty officers and seamen, from whom we would draw our supply of sub-instructors. This is particularly the case in regard to the ignorance of details of their work. It is my opinion that in any system of instruction, the details in all work, can not be given afloat alone, but appliances on shore and small ships are essential. A four months' cruise during the year I should prefer to one of six weeks. In addition, a system of sending men back to the training station for a post graduate course for petty officers I would suggest as most desirable. From my experience on the Minnesota I should strongly urge a stated course, and that the boys should not be taken from the training ship until this course is finished; but if the boys are taken from the training ship or sent to it without regard to the state of their instruction, or to any system, of course the results are meagre and in the highest degree unsatisfactory to the instructors and to the service at large, besides being very unjust to any system. Furthermore, as it has been justly stated, any one plan is better than a variety of systems carried out in a desultory manner, so I thoroughly agree in the suggestion in regard to the great desirability of a single head. From the experience obtained at the rendezvous of training ships at Hampton Roads the present lack of unity was most evident; each ship had its own system and there was a great indifference to the system, and experience of others. The *desideratum* seemed to be independence of others. It is certainly of great advantage to have a central station and a uniform continuous system; and, to my mind, Narragansett bay affords a better place than New London for such a station.

Lieut. Brown.—In regard to elevating the character and moral tone of the seamen of the Service, in my opinion, much can be done by more considerate treatment. If ships are made prisons we can only expect to have jail birds willing to serve in them. In my short experience I have repeatedly known of men being kept on board ship six months at a time. I can see no reason why the crew should not be allowed to go ashore under similar regulations to those which now apply to the officers.

Then in regard to money. I have known men to come home from a foreign cruise with plenty of money on the books, but they had been deprived of it during the cruise only to enable them to go on an extended spree upon being discharged. The money earned by the seaman is his, just as much as that earned by the officer belongs to him. If he (the seaman) is unwilling to save it up on the Paymaster's books, so as to have it at the end of the cruise, it is useless to make him do it with the hope that he will properly expend it after his discharge. In the vessel under my command every man is required to keep one month's pay on the books, he can draw the rest if he desires, and every one is entitled to go ashore every other even-

ing. Misconduct, as a rule, is punished by other methods than by restricting money or liberty. I have during the last eighteen months carried out these regulations and have no reason to desire to change them.

Lieut. B. NOYES.—I would like to ask Lieut.-Comdr. Chadwick the percentage of boys that re-enlist under the English system; also in regard to the sub-instructors, who compose the drill masters and the schoolmasters. I think on the Minnesota our tendency is to approximate to the English system, though we cannot depend upon having the boys through any stated course.

Lieut.-Comd'r. CHADWICK.—In answer to the question of Lieut. Noyes, I would say that I cannot state the exact percentage of those who have passed through the training ships, who re-enlist after the first discharge, which takes place at the age of twenty eight but it must be very large, as so far as I could find, nearly all the blue jackets, or at least a vast majority, had been training ship boys.

In answer to the other question I would state that most of the drill-masters are graduates of the training system, and that all of them are men who have been passed through a long course on board the Excellent or Cambridge; the schoolmasters are when boys, selected from the boys of the Greenwich hospital school for the sons of seamen. They are given a six years course of study and of duty as pupil teachers on board the training ships and at the school itself. The course is a very rigorous one and turns out a high class of men.

All boys on leaving the training ships are drafted for general duty in vessels of all kinds. Of course only a limited number of the young ordinary seamen can receive the extra training I speak of in the Atlanta. I would state again that all boys are rated ordinary seamen, or ordinary seamen 2d class, when they are eighteen. Under no circumstances can the rating of boys be retained after eighteen and one half.

NAVAL INSTITUTE, ANNAPOLIS,

March 3d, 1880.

PROFESSOR N. M. TERRY, U. S. N. A., in the Chair.

SYNOPSIS OF A LECTURE ON COLOR BLINDNESS AND ITS DANGERS ON THE SEA.

BY B. JOY JEFFRIES, M. D.

I need not remind the members of the Institute that there is danger in the inability to distinguish instantly and accurately the color of the red and green side lights, the colors of signal flags, of buoys, marks, and light-houses. The extent of the danger will of course depend on the number of people having any chromatic defect of vision and how complete this is. Now, although warnings were given as to the frequency of color blindness and its dangers on land and sea as long ago as 1854 it has since then, as before, been regarded by the general community, as, an infrequent, rather scientific curiosity. Its great practical importance on the sea and on railroads has only been brought forward and explained to the community during the last five years, most notably by Prof. Holmgren of Upsala, Sweden. His monograph excited a great deal of attention as soon as it appeared in French and German. A brief translation of it is in the Smithsonian Reports. It is also incorporated in my volume on "Color blindness, its Dangers and Detection," now adopted as a manual for the medical officers of the U. S. Army, Navy, and Marine-Hospital Service. Perusal of this monograph will convince any one of the truth of what I would here say in reference to the frequency of this defect, its peculiarities, and the methods of detecting it.

It is only in the centre that the normal retina has the fullest power of form perception. This is also the case in reference to color. The perceptive elements of the retina are more frequent and more closely packed at the centre, decreasing outward to its limits at the exterior portion of the eye. A practical point is to be recalled in reference to the use of color for signals, viz., that a very simple eye is needed to receive color impression and transmit it to the brain, whilst for form perception the eye requires all its dioptric apparatus, and this also in

its most perfectly normal condition to have good visual power. A person so blind with cataract as to only tell light from dark will appreciate quite pale shades of color. In the centre of the retina is a zone where all of the three base colors now generally accepted, red, green, and violet, are perceived; next outside of this a zone where only green and violet or blue are perceived, and beyond this another zone where blue alone produces its effect. The so-called Young-Helmholtz theory of color perception is, that there are three sorts of nerve fibres or retinal perceptive elements which receive or are sensitive to these three colors, red, green, and violet. The greater or less stimulation of these in different proportions is supposed to give us all the variations of the colors. This theory has been used in the explanation of color-blindness, which is considered to be either red, green, or violet blindness. The first two mutually include each other, and the last implies blindness to yellow, as well as to violet or blue. The adoption of this theory in conformity with the best and highest authorities, or of the theory of Hering, is of no importance in reference to the practical relations of color-blindness. Theories explain but do not alter facts. Facts prove that there are persons blind to red and green, or to yellow and blue or violet. Red and green blindness are much more common. Violet blindness is a very rare occurrence, but nevertheless has been found. What proportion of people are color-blind has been the subject of much discussion and debate. Since Prof. Holmgren has put into the hands of experts a very simple and ready method of detecting it, large numbers of persons of either sex have been tested in Europe and also in America. I have examined over thirty thousand individuals, with the result of finding about four per cent. of males color-blind, whilst with females it is an extremely rare occurrence. Age, nationality, social condition, civilization or education have nothing to do with it. It is hereditary, incurable when congenital, and can be but slightly palliated by artificial means. It may be produced by some diseases of the brain, by injuries of this organ, and by poisoning from alcohol and tobacco. A case has been recorded of unilateral congenital total color-blindness in a young lady belonging to a color-blind family. The normal eye may be rendered hypnotic, and then becomes color-blind. The congenital color-blind eye may be rendered temporarily normal, also by being put in a hypnotic state. These peculiar conditions are at present receiving great attention from physiologists.

Different observers in various parts of the world having now established the fact that four per cent. of males are more or less color-blind,

it will naturally be at once asked, How is it that this has not been known before? The answer is that with previous methods of examination they have escaped detection, whilst only since accurate and ready methods have been introduced was it possible for experts to—as now—examine large numbers with any scientific method. The manual above spoken of must be referred to in explanation of how the color-blind escape detection. The limits of this article prevent entering into it here. It is a curious study by itself. That the color-blind have eluded and do escape detection is one source of danger from this defect. It requires a pretty thorough knowledge of the physiology of the color sense, and an acquaintance with the vision of the color-blind to enable even medical experts to grasp the whole force and meaning of a chromatic defect of the eye. When color-blindness is spoken of, it means generally red and green blindness, or red-green blindness, as some would call it. This only interests railroads, whilst at sea violet-yellow blindness is also important in relation to the colors of signal flags. As remarked, this species is extremely rare. A person color-blind sees, in the proportion he is blind, all his blind color and its opposite (red and green) so much darker; or, rather, so much like gray, or a neutral color. The darker the color the darker the gray. For example, very dark red or green becomes black, et cetera. Hence a red light becomes a white one, *very dim*, or a green the same. A red buoy cannot be distinguished from a black one. A red signal light or lighthouse seems simply a dim white light. The colors of the side lights are confused or wholly gone. A naval officer slightly green-blind remarked that at a distance where the *red* light seemed marked in its color he could not distinguish the *green* light from the mast-head light. The difficulty of appreciating this on the part of those to whom it is new, has naturally been a serious drawback to the introduction of the very necessary examinations for the detection of color-blindness, and the elimination from posts of danger of those who are thus afflicted. The color-blind should not be, of course, allowed to enter the navy in any position where their want of color perception will be a source of danger to the vessel.

To the laity nothing would seem more simple than asking a person the names of colors in order to ascertain whether they were color-blind. Yet, as Prof. Helmholtz has well shown, this is perfectly useless, and as Goethe long ago said, such testing will but make the examined and examiner crazy. What we need is some method by which we can find the exact effect of the color on a person's brain. This we can do if we

require them to *match* a given color from a collection of colored objects. This method of comparison is alone of avail. Of those suggested none is more simple or surer than that suggested by Prof. Holmgren and now adopted in the U. S. Army, Navy, and Marine-Hospital Service. It is by colored worsted, and is described in detail in the manual above referred to. A mutual language of examiner and examined is not necessary. Any wild or uncivilized tribes may be tested by naval surgeons, whenever met during the voyage, thereby gathering for us valuable ethnological data as to the color sense and its development. I employed it in my testing the students of our colleges and scholars of our schools, also railroad employes and officers and sailors. The text-book and worsted do not occupy eight inches square and can be carried and used anywhere in fair daylight. Other additional methods of deciding *quantitative* color perception are of course employed by medical experts in deciding cases. Those of Prof. Dondas and Prof. Holmgren, described in my book, are some of the best and most practical, being employed on the railroads of Sweden and Holland. Naval surgeons can however readily learn *de visu* how to detect color blindness with certainty by Holmgren's worsted test.

By reference to my volume it will be seen that several maritime nations besides our own have recognized the dangers of color-blindness on the ocean, and established regulations to control it in the navies and merchant marine. A vessel of one nation with no color-blind on the lookout will not avoid a collision when meeting that of another nationality from whose personnel those defective in their color sense have not been eliminated by expert examination and strict laws. A petition to Congress, in favor of which I argued before the Naval Committee, has been presented, asking their "consideration of a general law of control in the navy and merchant marine, of color-blindness and visual acuteness, and the agreement by an international commission of definite and uniform standards of testing these necessary qualifications."

NAVAL INSTITUTE, ANNAPOLIS,

Mar. 11, 1880.

Lieut.-Com'dr Harrington, U. S. N., in the Chair.

DISCUSSION.

A Uniform System of Rigs for Boats and Launches.

The Chairman:—

The subject before the Institute is one of importance to the Navy; for it does not appear that experience has produced in our service a system of boats and their sailing equipments. And, while the greater force of opinion inclines towards one rig as the best for cutters, the varieties of preference are not less numerous than the classes of boats and sails in use.

Safety, carrying capacity combined with fair speed, and capability of united action in fleets, are prime qualities in boats as in ships of war. In the organization of a system of boats for a man-of-war, the number and dimensions having been determined, the equipment should be designed to secure unity and precision in manœuvering under oars or sail. The classes of boats being reduced to the lowest possible number, and a uniform plan of equipment employed, the ships of the Navy will meet on even ground in that respect. I shall not enlarge upon this idea, but I consider it an important one; and I would carry the practice so far as to make the equipments of uniform size and interchangeable for the same class of boats.

A noiseless exhaust of steam being secured in the steam launches, the requirements of the torpedo service properly controls their equipment. Should spars and sails be supplied for use when abandoning ship, they ought to be of the same pattern as those for the sailing launches; and, in readiness for such an emergency, the boat should be stowed without its boiler.

Gigs, dinghies, and catamarans, of small carrying capacity, and not of the line of service boats, may be fitted as desired, and will furnish sufficient scope for the American desire for speed and novelty.

The service boats may be considered as of two classes, viz.; launches,

and cutters; the former including the steam launches when used without boilers, and the latter the whale boats. One size of whale boats, and two or three each of cutters and launches, should be sufficient; the dimensions of each size being enforced by regulation for all new boats.

I am of the opinion that launches should be rigged as sloops, the boom being fitted always with a topping lift. The gaff topsail is worthless in such boats, and works contrary to the rule of simplicity and handiness. Let us have as little gear as possible in our boats.

I prefer for all other service boats the rig known as the sliding gunter, regarding it as safe, economical, handy, and sufficiently powerful. The shape of the principal sails in this rig, that of the leg-of-mutton, has found favor among boatmen almost everywhere. The centre of effort is brought low, whatever amount of canvass is spread, by altering the length of the masts and the foot of the sail; and reefing is accomplished in a moment. For the foremast, a slot should be cut in the fore-and-aft piece, abaft the mast hole, and a guide board placed under the thwart, extending from the forward edge of the mast hole to the step, and flush with both. In making sail, the heel of the mast, pointed through the slot, slides upon the guide board and passes into the step without delay. The slot is then closed by a close fitting chock. For the mainmast, the slot is cut and the guide board placed upon the opposite side. With these arrangements, the short lower masts of the sliding gunter are most readily shipped and unshipped. In point of speed, there may be a slight difference in favor of the lug or the sprit sail, but I doubt it; and if such is the case, the superiority in that respect is obtained at the expense of the more important qualities of handiness and safety. There is another small argument in favor of the sliding gunter, which will appeal most to the Executive Officer. In a somewhat extended experience in that capacity, I have found that boats with the sliding gunter require, generally, fewer repairs for accidental injuries. The masts and topmasts are seldom broken, or carried away in use; and the boat gets few hard knocks, which may or may not be due to the superior handiness of boats with that rig.

I regard the sprit sail as unworthy of use. The dipping lug, used with a jigger, is still the regulation sail for cutters in the English Navy. It is an admirable sail in many respects, and appears to suit the broader English boats. The Forbes rig for cutters, illustrated by the drawing on the board, is a modification, apparently, of the lug sail, and, judging from the drawing, I should say it is a great improvement. It appears to obviate the necessity of dipping.

During my last service at sea I was a long time in the harbor of Montevideo, and I know of no better place for testing boats under all circumstances. The preference which I urge is chiefly the result of long observation and comparison of our own boats and those of the numerous men-of-war lying in that port. I remember that on one occasion we communicated with a mail steamer during the prevalence of a hard *pampero*, using one of the large cutters and sliding gunter sails, after others of our own boats and a large cutter with lug sail from the English flag ship had failed in the attempt. When hard work was to be done we looked to the sliding gunters to do it; and I do not think they were ever beaten in any weather by foreign boats. The practical judgment of the men, accustomed to handle the boats daily, is generally correct. I have had many proofs of their preference for the sliding gunter over boats of equal size and model fitted with other sails, notwithstanding an occasional enthusiasm for the lug and the sprit sail, which I regarded as the expression of excitement and love of danger.

One word more as to uniformity and system. I have often witnessed with admiration the precision of evolution under sail of the boats of the English and French. The latter excel, and I think it is due to the uniformity of their boats and equipments. Under oars our own boat drills are excellent, the rapidity of evolution being governed by the full speed of the slowest boat; but, when sail is made, the inequality of our boats becomes apparent to a degree suggestive of regret and sometimes of mortification. The French have but one size of whale boats and distinct classes or sizes of cutters, and the area of sail is determined with an approach to equality of speed. The sliding gunter possesses peculiar facilities for sailing in squadron. By brailing up the foresail, or letting go the halliards, nice alterations in speed may be produced and the unity and order of the squadron preserved. Other equipments may possess this facility, if not in an equal degree; and if the boats of a ship are supplied upon one plan, slight alterations in the area of sail, easily made on board at the beginning of a cruise, will lead in these drills to the perfect unity and support which in a larger field is the soul of success. When boats of widely different lines and rigs meet in our squadrons, the evolutions are not well performed. To alter the sails on board ship and to reduce them to one class, takes time and costs money. And what if one commander employs one rig and his friend in the squadron chooses another? The English have sacrificed speed in their boats for carrying capacity. Should we not spare a little, if necessary, for objects as valuable?

Lieut.-Comdr. TRAIN. I think that it is extremely difficult to decide upon a rig that would suit any particular class of boats in our service, until all the boats composing the class are constructed on somewhat the same model and intended for the same purposes. As affairs are managed at present, the first cutter of one of our vessels may be the rejected barge of some admiral, the whale boat may have been bought from a New Bedford whaler; and the rig that would suit such boats, of no use except for carrying passengers,—would be totally unfitted for an old-fashioned, large, heavy, useful first cutter, or a cumbrous navy-yard-built whale boat. An attempt has been made to get boat rigs into some kind of a system; but I do not think it was successful, as ships are not now fitted out in accordance with it. Until some such system is applied to the models of the boats as well as to the rigs, each commanding officer or first lieutenant will be obliged to cut and re-cut until he gets his sails to suit his boats.

So far as the choice of rigs is concerned, I have yet to see anything superior to the sliding gunter, as fitted here, for the ordinary whale boat or cutter. I know of no objection to it except that when blowing fresh the yard occasionally is carried away, but it is easily replaced. In regard to the rig of a launch, I am decidedly in favor of the sloop rig. I do not mean by sloop rig the yachting affair you sometimes see, with gaff topsail and flying jib, but an honest, stout mainsail and jib, wire rigging, a boom topping lift, an iron rod over the tiller for the traveler for the main sheet, plenty of ballast, and a false keel. Rigged in this way, a launch becomes a serviceable vessel, and can be sent away with a surveying party for two or three weeks, or can carry passengers or provisions across a stormy sound thirty or forty miles wide, to some purpose. Of course the objection to this rig—that it has to be permanent, as it were, and that the mast cannot be stepped and unstepped by signal from the ship in boat exercise—will have different weight with different officers. For myself, when I rig a launch I want it rigged for use; and in a launch when rigged, the oars should be auxiliary and the sails permanent, and not the other way.

Lieut. BELKNAP. I believe the chief end of men-of-war boats to be capacity for carrying great weights with safety; that this has to a great extent been sacrificed for beauty and speed, in the boats built for our service, I think but few will deny. Very few if any of our vessels carry enough boats as they are now built to accommodate their crews; and, in case of abandoning a ship, a third, if not more, of the crew would be obliged to trust themselves to such rafts as could be hastily

improvised for the occasion. In an instance which came recently under my observation, five boats were all that one hundred and thirty people had to depend upon in case of accident to the ship, and when all were in the boats, the gunwales were but an inch or two above the surface of the water. The boats could have taken probably seventy people with safety. Abandoning ship, it is true, rarely occurs except for exercise; but anchors, provisions, and large bodies of men have frequently to be carried, and those of us who have had such boat duty well know the anxiety experienced when a moderate sea was encountered. With more beam and higher freeboard we would gain not only greater carrying capacity, but also greater comfort and safety. The first thing, then, to be done is to alter the construction of our men-of-war boats; after that, to choose a rig which would give as much speed as compatible with safety. If we decide to build boats similar to those in foreign navies, we will probably find it necessary to adopt the rigs used by them. The sliding gunter rig, so favorably regarded in our service, may be found to be totally unsuitable for a boat with more beam and higher freeboard. For cutters built upon French models, for instance, I doubt if our experience would lead us to adopt other than the French rig. Pending the construction of more seaworthy boats, I would state that I think the sloop rig for launches both unwieldy and unsafe. I have in mind two instances, and no doubt many of you can recall others, where launches have capsized, owing to the defects inherent to this rig. A squall strikes the launch, the boat heels, the boom takes the water, and over it goes; or the order is given to drop the peak, and in the excitement of the moment the topping lift is let go as well, with the same result, The mast is so long and heavy that the launch must be rigged alongside ship, and the ballast must be passed in. If the latter is metal, it is apt to damage the boat; if sand, it takes up all the room amidships. There is so much gear, especially when two jibs and a gaff topsail are carried, that it takes some time to reeve it off, besides continually fouling. In boat exercise, the launch cannot shove off from the ship under oars, and step masts and make sail afterwards with the other boats; besides, when once rigged and ballasted for sailing, sail it must, wind or no wind, for it is almost impossible to drive such a weight through the water with oars. The masts of all boats should be cut the neat length from the after to the forward thwart: they may then be laid, when not in use, upon the fore and aft piece, the cover passed and neatly lashed, while the fore and stern sheets would be free. Launches and cutters should be rigged with jib, and lug fore and main

sails, the only difference being that both fore and main sails should have dipping lugs in cutters, while launches should have dipping lug foresail and standing lug mainsail. The peaks of the lugs should be high, to counterbalance the lack of height in the masts. This rig combines the advantages of uniformity, simplicity, ease of handling, and safety. Whaleboats and gigs should have the sliding gunter rig, which, though cumbersome when not in use, is perhaps the rig best calculated to gain speed with safety in single banked boats. Dinghies should be fitted with a leg-of-mutton sail; and in connection with this boat I may say it is at present neither a dinghey nor a cutter. I think it would be better to do away with it, in its present form, and to substitute a two-oared or a four-oared skiff. The advantages of a boat of the latter description are too well known to need mention.

Lieut. Wise. For cutters and whaleboats I believe the sliding gunter rig to be, the best; but mention having been made of some of the disadvantages of that rig, I want to call attention to the Chinese rig. I have seen a ship's cutter, rigged with the ordinary lug foresail and boom mainsail, very much improved in sailing qualities and in safety by adapting to the sails the Chinese fast-boat bamboos. Sails thus extended are very flat, are quickly and easily reduced to suit any breeze, and when furled are light and do not take up more space than with the ordinary yard, boom, or sprit.

Lieut. Soley. I am very glad that this subject has been brought before the Institute, because I am sure that it is one which merits a great deal of consideration, which it rarely receives. In presenting my views, I wish first to bring to your notice a point which I think is often neglected and that is—For what use are the boats intended? If they are to be considered as intended for pleasure boats, or for pulling or sailing races, I am ready to discuss them from this standpoint. But I do not think they are intended for any such purpose. A man-of-war is a fighting machine, and every thing on board should be prepared and equipped with a view to fitness for that common end. The boats may be used for fighting and very often are; sometimes more than the ship is: therefore I say that they should be built, rigged and fitted to best carry men, guns, arms, ammunition, food, and water, under all circumstances, and that every detail should be in unison with the purpose for which the whole is intended. There is another use for boats only second to the one which has just been mentioned and that is a refuge in case of accident to the ship. How many of our ships are there to-day which can float their crews in their boats, even if they can lower

them, and how many boats are fitted so that if lowered in a seaway they can be readily detached from the falls?

These two considerations seem to me to be of such vital importance that they must be paramount in the subject under discussion this evening; and no matter how we may think, no one can divest himself of a certain amount of responsibility, for if any one of us finds himself conducting an expedition, and is obliged to leave behind a large proportion of the men who should go, because the fast pulling boats will not carry them in rough water, or because the boats are so encumbered with large sails and heavy spars that they have no room left, or still worse if in the dark watches of the night there comes a sudden crash and the order to abandon ship, what is to become of the poor fellows who have no stations in the boats? If any condition of effectiveness in the parts of our fighting machines is neglected, then each one who does not strive for their betterment becomes responsible.

I knew beforehand that I should find myself in the minority in discussing the rig of pulling launches. I do not deny that the sloop rig is pleasant to the eye, and that it is convenient for certain work. The spars are five in number; bowsprit, mast, topmast, gaff and boom: the sails are three; jib, mainsail, gaff topsail. The spars and sails are large and heavy, and I think every one will confess that he is glad to get under a yard or a davit to step his mast, and when that is done it takes some time to bend the sail and get every thing ready for sailing: let us now apply either of the tests you like to this rig and see how it will suit. Suppose the launch is going on a distant expedition; it contains a 12-pdr. howitzer, 28 men, ammunition, field and boat carriage, water, provisions, stove, anchor and chain, oars, masts and sails etc. The wind may have been fair at starting and we made sail and all went well. But after a while the wind came ahead with a little sea. Now we have a difficult task to perform, viz., to unstep the mast, unbend the sails, and stow them all so that they will not be in the way for pulling; and it reads very much more easy than it really is. Or if we apply the other test, where shall we find the boat which is about the best sea boat in the ship, and can carry most people; snugly secured in cranes, with upright davits topped in; the spars are so large that they are kept on the booms, the sails are so large that they are in the sailroom. What are the prospects of those who are stationed in the launch when the ship is abandoned? One thing more about the sloop rig; I think it is dangerous; no boat

should be so rigged unless it is decked over, partially at least, and properly ballasted.

Now I wish to suggest for the launches, two lug sails, dipping, the forward one being the larger, and with the seam abreast the foremast cut to the yard so that the forward part of the sail acts as a jib, and it really is not dipped at all; two masts and two yards are required only, and these would be of a size not excessive. These sails could be kept in the boat at all times and they, with their masts, are easily stowed or handled.

For cutters and whaleboats I am in favor of the sliding gunter rig, as I think it combines most advantages. The sails can always be kept in the boats and do not take up more room than any other rig. I think the whale boats should all be fitted with center boards. It has always seemed to me that our boats have too small rudders, at any rate it has been my experience that ships' boats work better when I have had the rudder enlarged. The sprit sail rig which is sometimes supplied for gigs and whale boats I think deserves the strongest condemnation: it is awkward, not easily reefed and very inconvenient to stow.

With regard to steam launches a great deal may be said, though possibly they were not intended to be included in the scope of the discussion. The same tests of fitness should be applied to these boats as to any other integral parts of the fighting whole. And I do not think this point can be urged too strongly, because it is too often slighted. The usefulness of these boats more than of any others depends upon their possessing certain qualities which fit them for battle, and every other consideration should be made subordinate to the one which would make them fit for battle service. They may be used for towing the other boats into action or for fighting with torpedoes at night. In either case they should be noiseless, as the success of an expedition may depend on the secrecy with which it is conducted. There is scarcely one steam launch or cutter in our service which fulfils this condition. I think I may safely say that there is not one which was made in this country. I do not believe that there is a single Engineer Officer here present who will say that such a thing is impossible; in fact we all know it is not. And yet why is such a vital consideration neglected? On a quiet evening one of our steam launches can be heard nearly three miles off, and this one objection would militate seriously against the fitness of the boat for such duty. If it is possible to do away with this objection let it be done. If it is necessary to use fan blowers, let us have them; if it is necessary to have more grate surface, let us have it; if it is nec-

essary to exhaust into a larger aperture, let it be done, but, at any rate, stop the noise. And moreover the steam launches or very few of them are built or fitted for work at sea. We are not going to use them always in smooth water: if one of our vessels meets an enemy at sea and can lower a fast launch with a torpedo, then we shall be two to one. But that launch must be strong enough to hold its engines and boiler with steam up *before it is lowered*, it must have steel protection for its men from musketry fire, in the shape of turtle-back or shields; it must be able to use salt water, it must be able to work in a considerable sea. I have no doubt that we can have such a boat if it is demanded. Why should we not have some now to try, to see what we may want in the future? The Chairmen has said something about the rig of catamarans. I think that as they are made now of india rubber and sometimes kept on deck and sometimes below, they are, when on deck, only a good substitute for a life buoy, and that the principal part of the rig should be bread and water secured to the raft in a water-tight box. If the discussion permitted something might also be said about life saving appliances. This part of the subject is well worthy of consideration. Few of our ships can float their whole crews in case of accident, and it seems to me that we ought to try to have all boats fitted with detaching apparatus and in addition to have collapsing boats or bridge rafts so that in an emergency all hands can be floated. But above all things let us remember that our boats are intended for fighting and that every detail of build, rig or equipment should be in harmony with that object.

P. A. Eng. KAFER:—The man-of-war boat which will be of the greatest use in time of war is the steam propelled boat, be it either launch or cutter, and it is well worth while to devote a part of the time allotted to the discussion of the rig of boats to the consideration of the question whether we have the steam launch or cutter best adapted to the demands of naval service.

The object of a steam launch is not the same as that of the sailing launch—to be able to transport men and guns—but to float the motive power necessary to tow a number of boats carrying men and guns, at a fair rate of speed. To do this the hull must be as small as possible, or the maximum motive power should be placed in a hull of given size. The nature of the service limits this size, in length, to about thirty-five feet, and as a fair rate of speed is desired this length also limits the breadth. Moreover to obtain the best results the draught should be very nearly constant; but this is impossible where the launch is made to carry men and guns. Therefore it may be assumed that in order

to have a constant draught and displacement, the steam launch or cutter should be of sufficient size to carry its machinery and necessary supplies, and these only. I have said that the length is limited to about thirty five feet, for beyond that a boat cannot be hoisted to the davits or swung on board conveniently. Were it not for this, it would be better to build a steam launch larger so as to make its lines finer; this would decrease its resistance and make it more efficient for towing or for speed.

A steam launch or cutter should be decked over whenever possible, so as to make the boat safe in any ordinary sea; safety being the first requisite of such a boat. Again, the machinery should be simple in design and of sufficient strength to stand the rough usage to which it is generally subjected.

Economy in fuel is also one of the chief requisites of a good launch; but to gain this to any extent while maintaining the average speed now attained, it would be necessary to increase the size of the boiler to correspond to the increased grate surface required. With a natural draught the consumption of coal will not be more than ten pounds per square foot of grate surface which will give about a 2½ horses power. To consume even this amount of coal, an artificial draught may be necessary, and assuming that 25 indicated horses-power is required to propel the launch at a speed of eight knots per hour it will take a boiler with ten square feet of grate to furnish the steam. Such a boiler would be a large one if constructed after the design of the boilers at present furnished to naval steam launches. To get the requisite power from a small boiler, it is necessary to use an artificial draught, increasing the consumption of coal per square foot of grate surface and making it necessary to carry a much larger fuel supply. If the draught is increased by discharging the exhaust steam into the funnel, there is the disadvantage of being unable to supply to the boiler the water which might be furnished were the exhaust steam condensed in a surface condenser. When the exhaust steam is used to increase the draught it is necessary to carry fresh water in tanks, adding to the weight to be carried. With a condenser and natural draught, the boiler might be much larger without increasing the weight to be carried above that of boiler and water in tanks.

The noise caused by the exhaust steam, discharging directly into the funnel, to which objection has been made, may be obviated by discharging the exhaust into a closed tank, and keeping an almost continuous flow from it into the atmosphere.

The machinery of a steam cutter may be made fairly economical and within the limit of weight for boiler, engine, water and fuel, by having a keel condenser and air pump, a boiler with circulating water tubes and by using a noiseless blower to increase the consumption of fuel.

Passed-Assistant Engineer Manning. Some of the gentlemen who have spoken this evening have objected to the type of machinery at present in use in our steam launches, on account of the noise it makes, which would render the boats useless as torpedo boats when the operations were to be secret, as they would announce their approach by the noise of the exhaust. Another strong objection to the present type is the expense and trouble of keeping them supplied with fresh water for their boilers. The question as to whether the Herreshoff system of machinery, which would avoid both these troubles, would not be preferable to our present type, has, I think, been very fully answered in the negative by Mr. Isherwood's recent report on that subject.

In order to avoid the noise of the exhaust, which in our launches, as in locomotives, is used as a blast to urge the combustion, we must condense the exhaust steam, and urge the combustion by means of a fan blower which could be driven directly from the shaft, or by the independent steam pump with which our launches are always fitted. The condenser could be of the type used so successfully by Herreshoff, being merely a copper tube running nearly twice the length of the keel, outside the vessel, thus saving the fresh water to return to the boiler. It is not usual, at present, to carry steam on any of our launches at much over one hundred pounds per gauge, but this could readily be increased to three times that pressure, and in that way the weight of machinery considerably decreased, with a probable increase of wear and tear. The weight of the present type of machinery makes our steam launches wet and uncomfortable, not to say unsafe, in a moderate seaway; and so any method of reducing the weights would be advantageous. In this respect, the weight of the fan blower and tube condenser would be less than the present fresh water tanks and the mean amount of water carried in them. As economy of fuel is not a matter of much importance in such craft, I think we will some day have a small boiler which will successfully use the liquid hydrocarbons as fuel, which would reduce the weight of both boiler and fuel. No one will deny that our present type of launch is a vast improvement over that of the first ones we ever had, which were twin screws, built in England, and used off Charleston and elsewhere as picket boats during the

war; but no improvements have been made in the last ten years, during which time very considerable advances have been made in steam engineering. It is a mistaken idea that three hundred pounds pressure of steam is any more dangerous than one hundred, and the extra two hundred pounds costs very little in heat, comparatively speaking. As to the boats themselves, they should be of steel, and with sufficient air tanks to float them, even when waterlogged.

NEW YORK BRANCH.

MARCH 18, 1880.

Lieut.-Comd'r CHADWICK, U. S. N., in the Chair.

Lieut. NOYES.—I suppose the universal criticism on our boats is that they are built for speed under oars and nothing else. Certainly, the long list of victories over the men-of-war boats of other nations in pulling races shows them to be superior in that respect, but there are a few other qualifications more valuable, in my opinion. First, I count capacity for carrying especially valuable, in view of the use of men-of-war's men ashore under arms. In this our boats are very faulty, for in the effort to make them speedy and with handsome lines, the necessary beam and high free board are lost sight of. As striking instances of this, I can cite the cutter of the Juniata bought at the Navy Yard, Toulon, in 1871; pulling twelve oars, it could carry as many men and arms as the sixteen oared cutters four feet longer, of the Richmond. These two may be taken as representing the different styles of French and American building. Again, the launch of the Juniata could not float the howitzer, ammunition and crew for which she was fitted. Second: the weather lines under oars or sail are too fine. Under oars, our single banked boats lack the necessary free board to pull dry in rough weather; they are too fine forward and they carry too many oars. Under sail, they are too long for their beam to work handily, too crank to carry sail, and, having no keel nor centre-board, they fall rapidly to leeward.

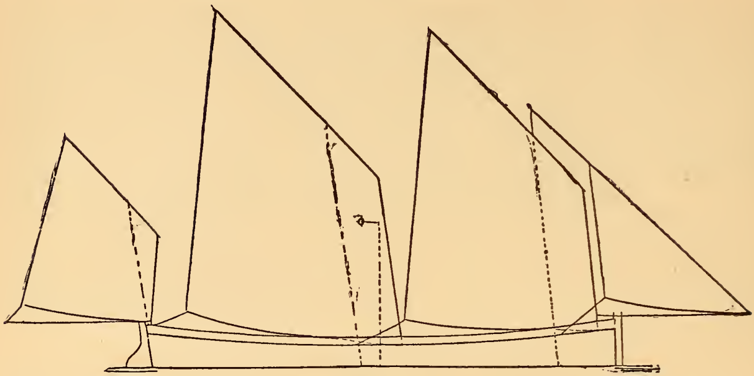
Our launches have the same faults, being built for speed solely. They are too fine forward and too low and are wet and leewardly in

rough weather. Launches should be sloop rigged, with jib, stay-sail and main-sail; the lower mast short, the main-sail square on the head and with but little hoist. A short, stout topmast would set a gaff topsail for light weather, without much extra gear, and would also do for signalling. The sail should balance with a single reef in the mainsail and the stay-sail alone set, so that in rough weather the boom would be in. The objection to the weight of a signal mast and the consequent difficulty in shipping it could be obviated by a box opening aft, from the step to the thwart, which would keep the heel of the mast always in place when stepping; and by using the jib halliards from forward the weight would not be felt.

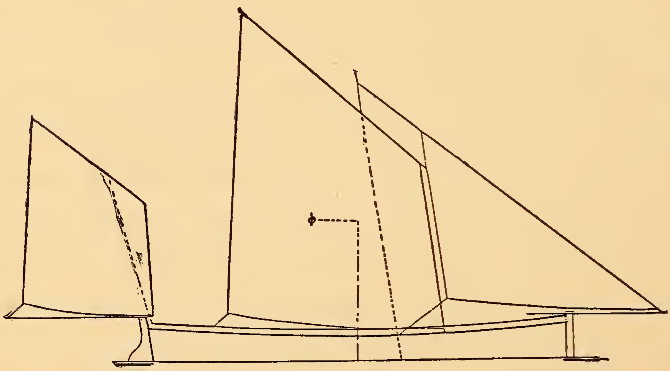
To our cutters, the same criticism, as to being built for speed alone, applies but in a greater degree. In addition, they are framed too heavily with the exception of the keel, which should be heavier than at present and the main strength of the boat. They should have vastly fuller bows; heavier stem pieces would enable them to carry and use a Gatling gun, an impossibility now. How necessary this last will become we may know if we are ever obliged to do patrol duty, watching against a night torpedo attack.

All the men-of-war boats I have seen lack several minor useful appurtenances found necessary in foreign men-of-war boats; such as, a permanent boat chest, chocks to close row-locks when under sail. The booms and masts are very badly arranged even where the rig best adapted to the boat is used. The masts often ship through a hole in a fore and aft piece on the thwarts, necessitating standing upon the thwarts to ship them. Masts should clamp to the thwart, and the above mentioned box from step to thwart, should be built in strongly; it is impossible for a mast to go adrift at the heel with such a box and that it has been used for years in the whale boats of whalers is proof that it is practically serviceable. The jigger booms often ship through a hole in the stem and are unshipped with great difficulty; they should be stepped in a movable heel iron and be clamped over the top of the stem so as to allow them to be triced up. Cumbersome iron work is frequently put outside the stem for shipping the masts, flag staffs, &c. All this should be inside and would be, I presume, were the boats not fitted with rings for hoisting, at the extreme ends—a most vicious practice, tending to break the back of any boat.

For the larger cutter I would recommend the rig shown in figure 1, with jib, fore and main sail and jigger. The advatages of this rig are a large spread of canvas, with the stern sheets fairly clear of booms



NO. 1
CUTTER 30 FT.



NO. 2
CUTTER 28 FT.

and sheets, very little gear, while it is strong and easily reduced to handy sail for heavy weather. After taking in the jib and jigger, all the sail is in the boat at hand for reefing and shortening and leaving enough sail to work the boat. The masts are short and the peaks of the lugs high; the yards should be hoisted with a block fitted to the traveller, so that the halliards may not be slacked off, as is often the case with single halliards, when belaying.

For smaller cutters, of less than 28 feet length, if built with good beam, I would recommend the rig shown in Fig. 2. The training ship

Minnesota has three cutters fitted in imitation of this rig, but unfortunately the imitation is very poor. The masts of the Minnesota's cutters are plumb, which is bad for hoisting a lug; the lugs are standing and very square on the head, and there is too much canvas aloft and too little below. The boats will not tack in any sort of a sea or with a fresh breeze, and the coxswains have so little reliance upon the working of the boats under sail, except with a fair wind and sea, that they know but little of bending or making sail. The only rig for cutters comparable to the foregoing seems to be the sliding gunter, but that labors under the disadvantage of the sails, of necessity made up with the masts, being in the way when rowing.

Whale boats should be clinker built with good beam, flat floors, and centre-board. They should be fitted with a permanent arrangement for steering with an oar, and the stern should be fitted out under water with a piece of dead wood that they might have a proper rudder. The sliding gunter is the best rig for whale boats, with all the sail inside the boat. The whale boats of the Minnesota are rigged with a dipping fore lug and a standing main lug, the fore lug being split at the mast to give a jib to the boat.

As a reason for the many varied rigs to be seen in our men-of-war boats, I may state that I have been told by experienced sailmakers that it is the custom to build boats, to fit them them with spars and booms and then to turn them over to the sailmakers with orders to place sails wherever possible.

The Chairman. I am in favor for a sloop rig for launches and sliding gunter for all other boats except dinghies, which should be fitted with a simple sprit. The present order of the Department in regard to boats is very good, but it lacks uniformity. There is no use in having part of the cutters rigged with sliding gunter and part with sprit-sails. Both styles are good in themselves but of the two I prefer the sliding gunter as it allows boats to lie alongside ship with masts stepped, it is more easily handled in every way, besides being safer. The Chinese system of rig is well worth imitating in some respects. I agree entirely with Lieut. Noyes in thinking our boats defective in strength and carrying capacity, and that we should give up building boats for racing purposes and build them more for safety and comfort; but I disagree with him in thinking the rig in fig. I, a rig of lugs with jib and jigger, a good one. It is too cumbersome, there are too many sails and spars, and it is not at all equal to the sliding gunter rig in ease of handling.

Lieut. HANFORD. We do not want all our boats rigged alike; a good rig for a launch might be a very poor one for a small cutter: but the idea that all boats of a certain size in the Navy should have the same rig is a good one. Safety, simplicity, weather lines and comfort are the points needed in all the boats of a man-of-war, except one or two in a large vessel, which should be fitted for speed.

I agree with Lieut, Noyes that our boats, as a rule, have not sufficient capacity and that two much is sacrificed to speed under oars. At the same time an endeavor should be made to give every vessel one or two fast pulling boats, the rest to be more capacious. It is useless to expect one boat to have all the good qualities, or any one rig to be without defects. I would suggest for launches the sloop rig without gaff topsails: a topsail adds little or nothing to the speed and is rarely used, For the larger cutters I would suggest a sliding gunter rig, and for the smaller, the sprit: this gives both uniformity and variety. My experience is that the jigger rig is always bad.

Lieut. Comd'r. GOODRICH. In the selection of a suitable rig for boats in the navy, the conservatism of individual taste and experience will necessarily enter as a powerful factor, since officers will naturally advocate that which they have themselves tried and found satisfactory as to appearance and performance. It would seem then that a fair discussion, having for its end a professional and impersonal good, ought to include on the part of those joining in it, not only arguments for the particular schemes advanced, but a realization of the influence of naval antecedents on the opinions formed. Of one thing I am certain, that there exists a wide-spread discontent throughout the service, on this subject, founded on the lack of uniform rig of boats of similar class and their but too frequent inability to perform the simplest manœuvres under canvas, resulting in a reversal of the old maxim, that sailing should be the rule and pulling the exception for a man-of-war's cutter.

The usual classification of a ship's boats is as follows, viz., first, Steam launches and cutters; second, Sailing launches; third, Cutters; fourth, Whale boats; fifth, Gigs; sixth, Dinghies.

Let us begin with cutters as forming the principal portion of the complement. A cutter's rig should possess 1st, Efficiency in propelling, or, more simply, permit an ample spread of canvass. 2d, Balance of effort, indicated by a firm weather helm while on the wind. 3d, Simplicity—as few parts as practicable. 4th, Ease and rapidity

of making sail. 5th, Convenience of stowage in the boat. 6th, No bowsprit. 7th, Handiness in reefing. 8th, Low centre of effort.

The first and second conditions may be fulfilled in a variety of ways. The third condition, however, reduces the consideration to rigs of not more than three sails and these sails must be as simply fitted as possible. A large dipping fore lug and a main lug either standing or dipping is perhaps the simplest of all. The liability of the fore lug to get aback in tacking presents a most serious objection to this rig.—The fore lug may now be split, yielding an arrangement found in the Russian service, or the split may be developed into a separate jib thus making a three-sail rig. Another three-sail rig is a jib with sliding gunter fore and main sails, the latter often provided with a boom. I may at once remark that my experience leads me to reject all dipping lugs and, briefly, to narrow down the choice to between the sliding gunter rig, just mentioned, and that composed of a jib and two standing lugs (the main with a boom.) In both the tack is hooked once for all and the only gear needed is halliards, sheets and main brails with one shroud on each mast opposite the halliards.

Under the fourth head, the lug rig appears preferable, as one set of hands can be loosing the sails while the other is stepping the masts. In the gunter rig both operations cannot be effected simultaneously, although it does not follow that much time is thus lost. The lug rig offers the considerable advantage of showing no canvas above the rail until actually needed, and of permitting a complete dousing of sail in case of emergency, leaving the masts standing, if desired.

Under the fifth head the lug seems better, for no nuisance is greater, in a passenger boat, than that of stern sheets half blocked by spars projecting beyond the after thwart.

Under the sixth head it seems merely necessary to call attention to the undesirability of bowsprits. Sufficient canvas in the fore lug will be found to secure the proper balance.

It would appear that the gunter is, if anything, a trifle more handy than the lug in reefing. The gunter shape carries its own recommendation for a low center of effort. On the other hand, the question naturally arises whether, in order to secure sufficient spread of canvas, it might not be necessary to lengthen the masts, so as to place the center of effort not far from that of the lug, and at the same time to cause the spars to encroach too much on the stern-sheets. Altogether, I incline strongly to the lug rig indicated, while confessing that I have not had the opportunity of testing the gunter on a scale great enough

to enable me to pronounce against it for cutters as absolutely as I do for it in gigs and whale boats.

As for dinghies, I suppose a sprit sail is as good as any, provided the mast be stepped so as to permit the sail to be used on a wind. Ordinarily the mast is so far forward as to forbid the sails being spread, except with a quartering wind.

Passing to the largest boats, the launches, why adhere to the cumbersome, complicated sloop rig? Even with the Selfridge step, it is very difficult to step the mast, except in smooth water, and the gear is desperately complex when one is in a hurry. Add a topmast, and the misery of the boat's crew is complete. I do not mean to say that our launches sail badly, but, in a boat's rig, something is demanded in addition to good sailing. The sail must be at the instant service of the men in the boat, and the spars readily handled without fear of damage. An average launch's crew would rather pull three miles than make sail. I have pointed out my preference for cutters. I am ready to be convinced that there are good reasons for not adopting it for launches as well. Steam launches and cutters are scarcely to be considered, as they would only be fitted with sails and spars on special occasions, when the best would be done for them which the circumstances permitted.

BOSTON BRANCH,

MARCH 31, 1880.

Naval Constructor S. H. POOK, U. S. N., in the Chair.

THE CHAIRMAN. In the hope that they may lead to discussion I would like the permission of the meeting to make a few general remarks concerning the rigs of boats.

Men-of-war boats, with the exception of steam launches, have experienced but little alteration during the last forty years, their latest dimensions being in accordance with the following order from the Bureau of Construction and Repair, dated April 1, 1870:—

"With a view of establishing a uniformity in the size of boats, the Department directs that hereafter all boats shall be built of the dimen-

sions herein inclosed, and that for whatever purpose a boat may be wanted, it shall be of the dimensions of the classes herein given.

"The length of the boat is from the fore side of the rabbet of the stem to the after side of the stern, at the height of the top of the gunwale. The breadth is the extreme breadth; and the depth is from the top of the gunwale amidships to the lower edge of the rabbet of the keel. In addition to the ring bolts in the stem and stern, there will be one through the fore end of the keel, and another at an equal distance from aft, to be used, if necessary, in hoisting the boats."

MEMORANDUM OF DIMENSIONS FOR BOATS, APRIL 1, 1870.

Launches,	Breadth = Length × .282;	Depth = Breadth × .40
Steam Cutters,	" = " × .260;	" = " × .46
Cutters,	" = " × .258;	" = " × .37
Barges,	" = " × .225;	" = " × .37
Gigs,	" = " × .185;	" = " × .37
Whaleboats,	" = " × .210;	" = " × .39
Dinghies,	" = " × .265;	" = " × .37

LENGTH OF.	Wabash, Colorado, and Class.	Guerriere, Lancaster, and Class.	Severn, Pensacola, and Class.	Ticonderoga, Plymouth, and Class.	Iroquois, and Class.	Shawmut, and Class.
Launches,	34 feet.	34 feet.	32 feet.	32 feet.	30 feet.	28 feet.
Steam Cutters,	33 "	33 "	33 "	33 "		
1st Cutters,	30 "	30 "	28 "	28 "	26 "	26 "
2d Cutters,	28 "	28 "	28 "	26 "	26 "	24 "
3d Cutters,	28 "	28 "	26 "	26 "	26 "	24 "
4th Cutters,	26 "	26 "	26 "			
Whaleboats,	29 "	29 "	29 "	27 "	27 "	27 "
Barges,	32 "	32 "	30 "			
Gigs,	30 "	30 "	28 "	28 "	28 "	
Dinghies,	20 "	20 "	18 "	18 "	18 "	18 "

Although the shapes have been slightly modified by succeeding constructors, about the same proportionate scantling has been used for boats for many years. I think the number of boats allowed in our navy is in excess of that of other services. In some instances the boats have been built of iron and steel, especially the steam cutters. It has been the experience of our officers that wooden steam cutters give the most satisfaction, being kept in repair on shipboard at less expense; although if iron boats, especially launches, were properly cared for, they would last much the longer.

An iron steam cutter built for the Richmond was the means of saving the lives of all on board, as she was run into by a ferry boat and struck amidships. If she had been a wooden boat she would have been crushed to atoms, but being made of iron she was simply bent out of shape. The shape was readily restored, and the boat was fit for duty again in two days—although the bad performance of the steam machinery of the boat caused her to be left ashore, the iron hull was still perfect.

An iron launch has been in constant use at the Navy Yard, New York, for eight years, and she is good for three or four years more, whereas wooden launches last on the average but two cruises, when they have to be rebuilt.

Wood or steel, I would increase the motive power of our steam cutters, and make them useful as torpedo launches. I would make use of the designs of these boats to demonstrate the various experiments which it would seem desirable to make use of. It would not greatly increase the cost if the Herreshoff boiler was applied to the hulls of steam cutters, and the speed of piston increased so as to give four or five hundred revolutions to the screw per minute.

Throrneycroft boats have a speed of piston of six hundred in a minute. While they have only about eight miles per hour at the same number of revolutions, one hundred and fifty, that we have, they have nineteen miles per hour at a speed of piston of six hundred revolutions and the boat seems to rise in the water and leave the following wave far in the rear.

Do we need a working launch often for carrying an anchor? How often is it used for this purpose in a cruise, and when used is it effective? It would seem desirable that the working launch should be a very able boat, as she carries a gun forward, as well as the first cutter. The latter is generally too shoal for the work, under the present form and dimensions. I think if we are ever driven into war, that both these boats will be allowed steam power.

Second, third and fourth cutters are good boats generally, and in good proportions. The new barges, double banked, seem to give satisfaction. The gigs are generally racing boats, and are built more with that end in view than any other, light scantling long and low—for comfort they should be deeper boats. Our whale boats, being modelled after the New Bedford whale boat, give perfect satisfaction, so far as I know, both as row and sail boats,—they are generally fitted with centre boards.

The dinghies, I think, are all wrong; being market boats, they should be deep enough to take a barrel under the thwarts and made more with reference to the work they have to do than for a pretty appearance. I think that if they were built deeper and made stronger generally, and of a somewhat fuller model they would give more satisfaction.

Although my preference, as regards the rigs of boats, is for sliding gunters, I should prefer to learn something on this point from the other members present.

The Hon. R. B. Forbes:—Permit me to present a few remarks on boats and boat fittings. Although I do not claim to be an expert in strictly naval affairs, I think I may claim some consideration from the fact that I began my nautical education at the early age of six and a half years; was captured three times by the English before I attained the age of nine years; began my sea life as a sailor at the age of thirteen; commanded a ship before twenty, and at the age of twenty-eight retired from the sea with a competency. When I say that I retired I ought to say that the retirement was rather nominal, as I continued as a merchant and a ship owner to go and to come until my last trip across the Atlantic in 1870. Since that date my sailings have been confined to short excursions in yachts and steamers. You will thus see that if I am not an expert *I ought to be.* I have always advocated progress, improvement, in all things. In 1823 I introduced the double top sail and the fidding of masts abaft. The original double top sail first introduced in the steam schooner Midas and soon after in the steam bark Edith and the propeller ship Massachusetts was improved by captain Howes—when I say improved I would not be understood as admitting that his rig was an improvement in appearance and in its adaptation to men-of-war, but it met the public want which called for something very cheap; something which could be put upon ships already built. My original rig required a long lower mast-head which in fact did duty as the topmast—Captain Howes hung his top sail or lower top sail yard to or near to the lower cap, and so the lower top sail was reduced to the size, or about the size of the common close reefed top sail. The rig could be applied, at a small expense, to any ship whose masts were in place; his old style top gallant sail and his royal remained the same; the only alteration consisted in putting another yard upon the top mast and accommodating the sails called upper and lower top sails thereto. He procured a patent for his modification of my rig, and many ship owners adopted it and it has proved a great boon to seamen as well as to insurers, owners and masters. I hold that very little strictly original comes

into the heads of thinking men—I remember that in my early voyages to the north of Europe I had seen many top sail schooners, and galliots, where the top sail hoisted upon the head of a lower mast; a head elongated so as to afford some hoist; I remember also, seeing the top gallant masts of one of our steam frigates, I think it was the Mississippi, fidded abaft; and I remember a small model of a ship given to me by Capt. Thomas Pierce, of Providence, which had top masts and top gallant masts fidded abaft. All I can claim of originality is the fitting of vessels with masts fidded abaft, in combination with double top sails and auxiliary steam power. One good feature of my rig as applied to the Massachutetts and Edith—one which I think a good deal of—is to be found in the fact that many of my spars and sails were convertible; that is to say, my fore yard was of the same general dimensions as the main top sail yard; my fore top sail yard the same as the main top gallant yard, and the fore top gallant the same as the main royal yard; and these relative proportions applied as well to the mizzen, so that fewer spare spars and sails were necessary, and on a pinch my main top sail could be made useful as a fore sail. On the first voyage of the Massachusetts the usefulness of this convertibility was well illustrated, as shown in the picture of the ship in the Lyceum. Most of the sails then set were badly split; some of them were so torn that not enough was left to make a cover for the main hatch, and it was on that occasion that we found our spare sails come into play. I saw then what I could not have credited unless I had seen it: namely, canvas in strips and *knots as hard as bullets;* wound up and knotted so that nothing but fire could disentangle the snarls.

But I am wandering very far from my text. I began on boats, and I have gone off on rigs. The truth is that I wanted you to know—I wanted the young navy cadets to know—that what I propose to write about boats comes from one who has given much thought to the fitting of ships and boats.

When a new thing, however simple, is brought to the notice of seamen,—and especially old salts who have been running all their lives in one narrow groove,—the first inquiry is, "Has it been tried?" We will suppose that this inquiry is made in reference to the boat rigs and boat hoisting gear on page 10 of the pamphlet* I have presented to you. I answer that I have often fitted ships' boats and life boats like Nos. 2 and 3. The rig is simple, easily managed, and

* "The R. B. Forbes Rigs for Fore and Aft Vessels, Steamers, Ships, Barks, Yachts, and Boats."

requires very little movement, which I consider *very important in boat sailing.* Rig No. 4 I always gave to the launches of my ships. I usually built and rigged the launch before the ship, and sailed her to and from the ship yard with one man. When I built the Antelope, in 1843–4, I rigged her launch in that way, and I well remember inviting several naval officers to go from South Boston to East Boston to see the little clipper Antelope. It was a squally spring day, and when my naval friends stepped into the launch, manned by myself and my ship keeper, they inquired if I was going to sail that craft in squally weather with only one man *and a half.* I said, "Certainly," and we shoved off. It was blowing fresh from the west or south-west, and as we ran under the lee of the Ohio, lying in the stream, I said, "Stand by, gentlemen, to keep her on her legs as we get under the lee." Any Duxbury boy would have understood that he was to get amidships when becalmed, and over to windward the moment she caught the breeze. I will not go further into details than to say we landed at East Boston in the midst of a hard squall, and I permitted no one to touch a rope or to give an order, save myself and my one man. My general impression is that if any of that crew are alive, they will date their first gray hair to that sail to East Boston with the split-lug-jib rig.

Although I had been much at sea and had often sailed in very badly rigged ship's boats, I may say that my education as a boat sailer began with the merchants at Canton and ended in yachting at home. All I learned about boat sailing while a sailor was not worth knowing. Ship masters, unless they happen to have learned how to sail a boat when a boy, somewhere on the coast, are, as a rule, very poor boat sailers; and sometimes men who were born on board of a boat, or brought up at Nantucket,—men supposed to know all about boats,—make the most ludicrous mistakes in boat sailing when anything new is to be tried. I will recite a case in point: I sent to Nantucket a life boat rigged with two sprit sails like Nos. 2 and 3, with orders to try her under sail in a rough time, and report on the rig, a drawing of which was sent with the boat. The trial came off, and the crew said "all worked first-rate"; but there was some comment made on the difficulty of unshipping the sprit quickly. This led to inquiry, and I found that they had unshipped the sprits and doubled in the large lot of loose sail, which, close hauled, must have operated like a back sail. When I explained that they had only to *sit still, slack the sheets, and brail-up the sprit, in order to reef,* they did not hesitate to say that they had found the rig good under very unfavorable circumstances.

In rig No. 5, page 11, it will be seen that the sail which I call a jib hoists on a running rope fastened to the end of the yard, so that it can be taken in and set without lowering the main sail. In No. 4, page 10, the jib has grommets on the head, so that it can be bent and unbent with only one seizing; the other earing being a grommet which shoves over a small pin in the yard near the head of the main sail. The foot of the jib should have on it a small stick or yard, so that with the tack fast to the stem when going in stays on rough waters, it may be manipulated by the sheet, so as to insure tacking. The sheet should be made fast to the middle of the stick on the foot of the sail, so that in going large, the tack being slacked and the weather sheet hauled in, the jib becomes a studding-sail, taking a position parallel to the main boom. Nos. 1, 2, and 6, page 11, are excellent rigs for pleasure craft; but the spars are too long to stow in ship's boats.

In fitting four launches carrying Dahlgren navy howitzers, during the war, I gave them the rig No. 4, page 10, and in thoroughly trying them in competition, during several cruises with the "coast guard," I found them to work well; and all things were so proportioned as to stow snug and leave room for the guns and fittings, as well as for the officers in the stern sheets.

Every naval man must fully realize that economy of space and ability to work the sails with the least possible movement of the crew are very important. The boats of vessels of war are—or used to be—fitted with false keels or shoes, contrived to be screwed on and removed easily. I consider this, as compared to a center-board, a very poor contrivance to keep a boat from making leeway when sailing close-hauled; a thing very much in the way in landing, and in slewing a boat on a beach, or in the water by the oars. A center-board boat has no keel to stand in the way of stowing, and the box affords a good shifting-board to keep the ballast steady; it enables the boat to hold a good wind and with it she will be sure in stays. The only possible objection that can be made to it is in the fact that a centre board box, as usually fitted, prevents the stowage of another boat inside of her; but even this may be overcome by fitting the box to ship and unship without much more expense than the fitting on and taking off of the false keel. In consulting one of our naval men, now a commodore or an admiral, about centre boards, his chief objection seemed to be that as exercise at the oars is good for muscular development and full occupation a blessing, he preferred to pull to windward and so did not care specially for a weatherly craft. I thought this a very weak argument against cen-

tre boards, because we are not compelled to pull to windward instead of beating, and when necessary to warm up the men we can pull just as well in a centre board as in a keel boat. Every one who has been much away in boats, especially in time of war, must admit that a boat which can beat well is the best for the comfort and health of the men. As a general rule the sails of boats in vessels of war are kept in their bags and very seldom used. Their constant use would tend much to give rest to the crew, to say nothing of valuable experiences. I have seen boats coming and going under oars in a hot sun from ships in such places as Macao roads, Montevideo, and Hampton roads, when sails would do the work in half the time and with much less exposure. The men in a ship of war get exercise enough for their muscular health, in carrying on the daily duties, and under hot suns every precaution should be taken to prevent unnecessary exposure. I am therefore a strong advocate for centre boards and for rigs that can be managed without dipping and with the least possible movement of the crew. The fine boats of the Navy usually known as whale boats, although very different from whale boats in model, should be rigged with the brailing sprit and they should be supplied with steering oars, so that on going through a surf they can be managed better than with a rudder. They are not, however, to be considered as good surf boats; they have centre boards I believe, and when properly rigged must be very fast under sail as well as with oars.

Finally, I desire to say a word on the hanging of boats: In war ships they should be hung so as to be very handy to swing out and in, and should be as far as possible out of the way of being swept off by a collision—a contingency very apt to happen in war times. Is this *ever* done? I mean on regularly rigged and fitted steam frigates? Is it not usual to see boats permanently hanging far out from the side of the ship, ready to lower away, and ready to be swept away by daily occurences? Instead of being hung abreast of the shrouds where they cannot be swung in, they should be placed between the shrouds, so that they can be swung in, and for sea use be kept much more out of the way. It has been said that the reason for hanging boats abreast of the shrouds is that the davits, can be supported by topping lifts: this does not seem to me a very strong argument against placing them elsewhere. Davits should be strong enough to support the boats of themselves. The small illustration of my plan for hanging boats on page 10 of the pamphlet will give a very fair idea of my mode of controling the hanging of boats. If I were called on to fit a combined steam

and sailing ship I would have her so fitted as to permit of running along side of an enemy, grappling, and boarding her without losing a boat, without carrying away a shroud or an anchor. I would have a strong guard all round her, wide enough to protect the muzzles of the guns, and the lanyards of the shrouds. In a ship large enough to have this guard well out of water I would place it just below the port sills; in smaller vessels above the ports; in the first case, I would fill in after the manner of a "sponson," so as to break the shock of seas.

I do not know how far the muzzles of modern guns project, but I assume that a sponson of two and a half feet tapered off to about one foot at each end would permit of scraping alongside of a vessel without any catching of the usual projections. I can see no objections to the sponson of two and a half feet on a big ship, except its general appearance and the possibility of its interfering with depressing the guns where the sponson or guard is below, and of elevating greatly where it is above the guns. But I assume that gatlins, musketry, and howitzers are to look out for boats, and that a near approach to an enemy high out of water requires only point-blank range. When certain long, sharp steamers were devised and built early in the rebellion, it was originally designed to set up the shrouds and back stays to the plankshire inside the bulwarks, and to have little or nothing outside to prevent running alongside a vessel. I rebelled against this idea, first because the long masts could not be supported by so small an angle of shrouding; secondly, because in running alongside of a ship, we could not well afford to run the guns in, and if we left the muzzles sticking out two feet or more they would be entirely demoralized by the shock, unless indeed every one was discharged at the moment of contact. I called the attention of the Naval authorities to' the very great danger of so rigging valuable ships and I went so far as to print a lot of pamphlets illustrating the folly of setting up shrouds at the plankshire inside the bulwarks. I went to Charlestown not long after to see one of these "Canoe Ships" launched and there I met Chief Constructor Isaiah Hanscom, and seeing channels on the ship I remarked upon the fact, and he replied "we are indebted to you for that improvement." Some of you will naturally ask "In running alongside a ship what is to become of your longest yards, projecting as they do beyond the line of protection?" My answer would be brace up sharp, and if you find that does not protect your lower yards you must come to the new rig illustrated on page 7 of the pamphlet.

Gentlemen, you must consider that much of what I have said ap-

plies principally to the type of ships which we knew before the days of iron-clads and other monsters.

One word more about the Navy we ought to have; one word about coast defences and I have done. To my notion this country can never carry out the idea of competition with European first class maritime powers; we can never want to send a Bellerophon or any first class armored hulk to the other side of the Atlantic. I would, therefore, have floating batteries for coast and harbor defence, and revolving turrets in casemate at prominent points wherever we need large, long range rifled guns; a few of these would do more good than a big fort kept up at great cost. For the annoyance of the commerce of the enemy I would have very fast full rigged ships, mounting a few long range guns. I should calculate on running away from any iron-clad, and on being fast enough to overhaul the average merchant-man. These ships would cost far less than monitors and iron-clads and would make far more prizes. I would have all local military organizations on the land large enough and able enough to drive into the sea any invaders who might get into our ports, and I would so fill up all channels with torpedoes that there would be great risk in coming into any harbor. We would make peace much faster by my processes than by building any number of iron clads to be pierced by modern projectiles. A large lot of fast cruisers and floating "*gun carriages,*" in the shape of single gun ram gun-boats would do our business at small cost and our gallant "éleves" of the Annapolis Academy would have some prize money to jingle in their pockets, instead of being smothered in an iron clad. Of course I shall expect that Naval men will remark that I am only a merchant-man and had best say nothing of war matters.

Comdr. SICARD. I regard speed under sail as rather a secondary consideration in Naval boats, and am not in favor of sacrificing anything of importance to carrying a great spread. If at any time a long run is to be made it is easy to improvise auxiliary sails to suit the case. The masts and sails should fit readily in the boat without projecting into the stern sheets, and should be of a simple design easily handled in bad weather. I like the sliding gunter rig best for all boats except launches and these I think may as well be fitted with the simple sloop rig without gaff topsail. The present lines of launches and large cutters are rather too fine toward the extremities for carrying the gun comfortably, and it must be considered that in the future a shield will probably be necessary with the boat gun, and thus will be entailed

an increase of weight which must be met by an increase of bearing. It is probable that during active operations in time of war we should be obliged to use steam as the motive power of our most efficient boats carrying guns. In this case, as but a small crew would be required, the gun would probably be mounted toward the middle of the boat surrounded by a sort of circular shield, the gun training over the top of its protection, or carrying the latter with it as it turns. This mode of mounting the gun gives that facility of horizontal train which is of such importance in flotilla manœuvres, when the gun must often fire in a direction quite different from the course being steered at the time. A non-recoil carriage might be used in connection with this arrangement.

Commo. RANSOM. How would you obtain an all round fire and how could the gun be placed so as not to interfere with the machinery?

Comdr. SICARD. I have not thought out any particular plan for mounting a boat gun in the manner to which I have referred; only it is apparent that more speed and facility for horizontal train must be given to the piece when embarked, and the plan I have touched upon appears to be about the only one that will give the desired result. A good practical non-recoil carriage for howitzers has not yet been introduced. Mr. Krupp exhibited two, some eighteen months ago; one was unsatisfactory but the other performed well with a full power gun weighing about two thousand lbs. It was of course too large for boat use. A machine gun could readily be mounted in the manner indicated.

Comdr. BATCHELLER. I think there is but little fault to be found with the general dimensions of our boats, considering simply their length, breadth and depth, though perhaps they should all be made deeper. But with the exception of the barge and possibly one cutter for a passenger boat I think they all have too little bearing forward. Particularly is this the case with the heavier boats intended to carry boat guns. There seems to have been a tendency in building our boats to fine down the lines to beat some other boat in point of speed, and with a great disregard of other essential qualities. I quite agree with what has been said in regard to rig; that the sliding gunter is best for all but sailing launches which should be sloop rigged. I doubt the utility of any rig for steam launches and cutters. I think the dinghey the most useful of boats and would not change her in any way except to make her deeper. I think our boats the best built and the strongest for their weight that I have seen, but they lack carrying capacity, owing to want of depth and too fine lines.

Lieut. Bassett. I do not know whether those present are aware that all of the boats, except the launches, of the two training ships—the Portsmouth and the Saratoga, have been rigged with the sliding gunter. As these sailing ships make use of their boats very often, it was found that the sliding gunter rig was best, and they were so fitted this winter at Washington.

It has occurred to me to ask why the whale boats which are, or ought to be the life boats of the ships are not fitted with air tanks, so as to make them more valuable as life boats? I once saw a whale boat upset and the crew rescued with difficulty, where air tanks would have made the boat easy to right, or at least the men might have clung to it.

The Chairman. I think Capt. Forbes arranged a boat with india rubber sponsons. I don't know how the boats performed. Boats have for a long time been arranged with chambers, but for some reason they are not preferred on ship board. You know all ships carry Admiral Ammen's balsas at the present time, and life buoys are always attached to the stern. I have an impression that when boats have been arranged with air tanks on the end, it has helped to capsize them—if I am wrong in this, I wish to be corrected. The models have had great sheer, and the tanks would be placed very high above the water. While I was attached to the New York yard, there was delivered a lot of "Raymond," or rather "Ingersoll" metallic life boats—they were arranged with a false bottom, and with the means of letting the water in or out. They were said to be self-righting, but I never saw one tried. I put one on each ship fitting out, but for some reason, of which I am not aware, they were not preferred. I have never heard a report from any one of them.

The first cutters should, in my opinion, (as all boats which have to carry guns,) be made of different models from the present, more stability as well as depth, and more displacement at the bows are required—they should have longer oars more like sweeps. In regard to dinghies, I would state that the Kearsarge left one at Mare Island while I was there, which gave general satisfaction to the officers. It was no longer than our boats, but deeper and fuller and being a lap-streak boat, very light, nothing but hoops for frames, yet quite strong and burdensome.

Comdr. Ames. As regards the use of india rubber sponsons, I have examined several boats of the "Massachusetts Humane Society" fitted with inflating fenders and I have found that they soon become too stiff, and almost useless, not to speak of the danger of their becoming

punctured or broken. Solid cork fenders of the same dimensions are nearly as buoyant and much more practical. I strongly advise the substitution of cork for india rubber, which, by the way, has already been decided upon by the Executive Committee of the Massachusetts Humane Society. I approve of sloop rig for launches, with centre board. I made some experiments with the Resaca's launch when I was attached to that ship. It had no centre board and I saw the need of one. I think the chairman's suggestion as regards building dinghies deeper and with greater beam, a good one. At present dinghies are too small for the purposes to which they are put. I think that the only way to really find out what we need in regard to boats is to construct a full set of boats and try them under the same circumstances, and under all conditions of weather and sea. Under such experiments, carefully made, we would soon develope the proper boats for general service. Different stations require different boats, and officers are apt to make up their minds from the last cruise, as, for instance, in the Mediterranean light boats will generally answer, while in South America—at Montevideo for example—the best sea boats are necessary. Comdr. Perkins has suggested to me that in China light boats are all that are required, native boats doing all the heavy carrying, and the lighter and faster the boats are the greater satisfaction they give. These considerations cause me to think that experiments to test all points of rig, model and burden would be satisfactory and at once settle the whole question.

PACIFIC BRANCH.

U. S. S. Pensacola, off Magdalena bay, April 16th, 1880.

Rear Admiral C. R. P. Rodgers, U. S. N., in the Chair.

The Chairman. I think that there is a general impression among the officers of the service that our ships' boats are the handsomest and fastest in existence but there seems to be a general distrust as to their carrying capacity and adaptation to the work which they may be called on to perform. When I commanded the Franklin I once put all the men into the boats; when full they could barely float, the water being at the time perfectly smooth, showing that had there been any sea all

the men could not have been carried. In providing boats for a ship more attention should be paid to the uses for which they are intended. Almost all the boats should be heavy, and intended for carrying, rather than for speed. The necessity for making boats so that they may stow in nests no longer exists, as almost all boats are now carried on the rail and therefore can be built more nearly of a size. Every ship should have at least two regular life boats. I am in favor of wood in the construction of boats and of iron in that of ships. Chief Engineer Isherwood's very interesting report on steam launches, in my opinion, may be taken as excellent authority. I would suggest for cutters, two working lugs without booms, and a jib without bowsprit.

After some discussion it was decided to discuss the topic proposed by means of interrogatories, which should be as follows:

I. Whether, in the opinion of those entering into the discussion, the present naval boats are what they should be; if not, what would improve them?

II. Whether the steam boat of a ship should be a launch or a smaller boat?

III. What should be the rig for launches?

IV. What should be the rig for cutters?

V. What should be the rig for gigs and whale boats?

Lieut. Meigs. I advocate full schooner rig, on the ground that it is best for expeditions away from the ship which launches may be called upon to undertake. Launches are not used as running boats, and can, therefore, be fitted with a standing rig. The schooner rig is better than that of the sloop as it does not require such lofty spars. The great trouble is that we have no recognized system of regulating the sizes of the boats supplied to vessels. There should be large boats fitted for carrying heavy loads and for life service, and lighter boats for passenger service. For mere passenger service I consider our light boats very suitable. I would suggest the use of iron in the construction of our boats, on account of its superior strength and rigidity.

Capt. Breese. I object to the use of iron, on account of too much rigidity; boats which work a little can always be pulled faster than stiffer ones. Boats of the Francis life boat type have been introduced in small numbers into the service, but have finally been rejected. If an accident were to occur to an iron boat, on detached service, it would be very difficult to repair it. With the exception of the barges, gigs, and some of the whale boats, the boats are not what they should be, the principal defect being want of capacity. With the exception of

the launches all the boats are too heavily built. I consider the proper rig for launches, two working lugs without booms and a jib without bowsprit, on account of the ease with which the sails can be stowed and handled. The sails should be of light cloth with slack roping so that the greater part of the strain shall come on the canvas. This principle should apply to all boats' sails.

Lieut. Meigs. It would be fully as easy to repair an iron boat, with proper appliances, as a wooden one.

Lieut. Mason. Our boats are not adapted to the service which they have to perform except as regards speed when unloaded. For a ship of the class of the Pensacola, for instance, there should be two large sailing launches, a steam cutter, from which, at sea, the engines, boiler and screw should be removed, so that it could be used for pulling and sailing, the end of the shaft being covered by a cap and the propeller hole filled with a plank stop. In addition there should be three large cutters all of the same size; two large whale boats fitted as complete life boats, to be hoisted on the quarters; one to be used in port for the ward-room officers, the other as the Admiral's service boat; a whale-boat-gig and a cutter-barge of the same size as the other cutters; a whale boat dinghey, as suggested by Mr. Adams, and a small wherry. All boats should be fitted to a certain extent as life boats. All available spaces under bow and stern gratings and thwarts should be enclosed, making water tight tanks which might be used for stowing the lighter articles of equipment, and provisions. All boats, and especially those designated as life boats at sea, should be fitted with patent lowering and detaching apparatus. One great objection to our boats at present is the lowness of their gunwales and the use of brass swivel row locks. Masts should be clamped to the thwarts with hinge clamps, instead of being slipped through a hole as at present; this would do away with the dangerous operation of lifting the mast so high without supports. The after-clamps should be on the forward side of the thwart so that the after mast may be shipped from forward. The sliding-gunter, in my opinion, will stow quite as snugly in a boat as any other rig, and can be handled more easily in making and shortening sail. The mast is shorter than in the lug or sprit rig, and the topmast does not take up any more room than the yard of the lug or the sprit. The necessity of dipping lugs in working is obviated, as well as the difficult operation of shipping and unshipping the sprit. In large ships two steamers would be found useful especially for torpedo service, as it

seems to be clearly proved by actual experience that torpedo boats should always be employed at least in pairs.

Lieut. INGERSOLL. I agree with most of the ideas already expressed, but I do not consider our boats well suited for passenger boats except as regards speed. I think that a great defect is our want of life boats. Every boat should be fitted with air-tight compartments either under the seats, along the sides, or in the bow and stern. In a large regatta which was held in the European squadron the sliding-gunter rigged boats of the Franklin were victorious in every race, and all the leading boats were of that rig. Subsequently, in a general boat exercise at Cadiz, the Plymouth's boats which had been rigged slidding-gunter on the station were the first along-side of the flag ship under sail, showing the convenience of the rig. Later a race took place in which four of the Plymouth's boats came in first with their new rig.

Lieut. ADAMS. I think that only the launches should be fitted for guns and that the cutters should carry only men and their equipments. Each class of boats should be as nearly as possible of the same size, as the old necessity of stowing boats in nests no longer exists. In place of the dinghies now supplied small fast whale boats of about equal size should be provided, to be used for boarding, carrying despatches and other light work, and each ship should have a small boat fitted for sculls which could be stowed inside of any of the other boats. The reason that a limber boat pulls more easily is that it is impossible for all the oarsmen to give their stroke at exactly the same instant, whereas in a steamer the movement of the propelling power is uniform. I prefer sliding-gunter rig with jib in large boats, but no bowsprit.

Lieut. GARVIN. I would suggest that the bowsprit should be fitted so as to be easily unshipped, to allow the use of a bow gun.

Lieut. YATES. I have found by experience that in manning and arming boats it is impossible to carry, with any chance of proper storage, the guns, equipment, stores and men, and when equipped I considered the boats unsafe in a sea way.

Lieut. KENNEDY. One great objection to our service boats is that the oarsmen are too much crowded, no room being given to exert their strength in pulling, and while I advocate an increase in the size of boats, I do not advocate an increase in the number of oars.

We need only two sizes of large boats, the larger to carry a howitzer or gatling gun, and to have good carrying capacity for heavy loads, the other smaller, but still to be capable of carrying the men in case of having to leave the ship or to land the battalion. I think that a

twelve-oared cutter should be a much larger boat than at present, without increasing the number of oars. Mr. Yates has referred to the trouble in carrying howitzers etc. in the launches; I have found the same trouble in carrying men and their equipments in cutters. The steam boat of a ship should be a cutter and its whole capacity should be devoted to steaming purposes, no endeavor being made to reserve space for passengers or freight; the boat being used for towing, despatch carrying, and torpedo service.

The Chairman. I think that we should not close the discussion without saying something in regard to balsas which approach very nearly, in the purposes for which they are intended, to the subject of boats.

A general discussion on this subject took place in which the following ideas were enlarged upon. That all ships should be funished with at least one large balsas or raft for life saving purposes, for landing men and guns, and if need be for carrying out anchors. That one or more small balsas should be provided, and kept inflated, and slung over the stern at sea ready to be lowered in case of man-overboard.

In accordance with the decision of Executive Committee, the foregoing Discussion was submitted for criticism to Rear-Admiral John Rodgers, the President, who returned it with the following remarks.

It will be conceded, without argument, that any boat for special service may be made better for that service than one designed for all work: the man-of-war's boats, except gigs and whale boats are eminently boats of all work. The gigs are made to carry the captain; the whale boats I consider specially made for safety in a seaway, and for landing through surf. Incidentally whale boats are used for all work but specially they are surf and sea boats. The launches are boats for burthen: and so indeed are the first cutters, but these must have certain speed and nimbleness not exacted from launches. It is difficult to say how much our cutters should be modified in shape, so as to get more carrying capacity. Where opposing qualities are demanded, such as speed and great carrying capacity, light draft, and lateral resistance or weatherly qualities, a compromise must be made.

In war, successful generals have attained their success by celerity of movement, appearing where not expected, throwing all their force upon a part of their enemies, and winning the battle before the slower enemy could bring up his supports. In cutting out, in boarding, in landing a detachment under fire, the slower a boat moves the more

loss will be incurred before the decisive moment arrives when the enemy is to be met on equal terms, and finally overpowered by force.

As to sea-going qualities, I think our boats with their crews would live as long as a fuller model. Some experiments have gone to establish that a boat with fine lines, when driven through the water at a good speed will make good weather longer than a bluffer bowed one. Foreign navies have deeper boats than ours. In sailing, this is an advantage, as it gives more lateral resistance, or makes them more weatherly; but all of us have felt the inconvenience of a deep boat in grounding far from a flat shore. The shallow boat is not less safe than a deep one, so far as the waves are concerned. The whalers make their boats very shallow and very light so as to get easily out of the way of the sea, and rise lightly out of the surf. Any model for general service must be a compromise, some qualities being left in a subordinate place, which on special occasions we shall wish had taken a more prominent one. In sailing, one will wish his boat deeper, so that she might be more weatherly. In landing on a shoal shore, or in tracking his boat for miles in surveying over a shoal, he will wish she were flatter. Ordinary uses come in ten thousand times for a single fighting expedition. The man-of-war is a fighting machine; but also one in which the fighting crew must live and occupy themselves in all the pursuits of their calling, in which, unhappily for the advancement of the Navy, war is rarely resorted to. It scarcely seems good practice to make a use so seldom demanded the one governing consideration in boat-building for men-of-war.

The present model is a compromise arrived at from many years criticism and service, and, I think, a happy compromise. I think, however, centre-boards could be introduced to advantage in all our boats. The frame of the centre-board well to be composition metal, with the proper recesses for receiving the timbers. If the sides were of brass, soldered or riveted to the frame, it would not add greatly to the weight. The boats could then be made with less dead-rise, than now. The boats could also be made to advantage with more free board—having one, two, or three more strakes, according to size. In regard to the rigging of the boats, I have little to say. The masts should be so short as to be carried conveniently in the boat, without extending into the stern sheets more than a few inches. They should be easily stepped or taken down in something of a sea-way; the sail should be easily reduced and simple, and have its centre of effort low. It is a combination of these qualities which has made the lug so long a favorite.

On our coast it has been found that North river sloops are unfit for ocean service, because, in a sea-way, the mast is pitched overboard. To avoid this, our small vessels for sea use are schooners, with two or more masts. The schooners carry about the same amount of sail that a sloop does; but the masts have individually so much less weight and length that they can be properly supported, which has not been proved true of sloops.

The launch is a row-boat, furnished with a full crew for rowing. The desirableness of moving independently of sails, caused the old row galleys to be used for war. The launch is a row galley; she should also carry sails; but when she fights she will in all probability follow the precedent of ages, and fight under oars. I recommend therefore for launches, as for all other boats, masts easily managed by the crew when in the boat,—to be taken down or put up at pleasure,—cruising under sail or rowing without masts, as the officer in charge may choose. In England and in the English Navy, luggers are, I believe, preferred to other rigs. The smugglers formerly used luggers as fast and weatherly; but I recommend sliding gunter masts, rather from what I hear than from preference derived out of my own experience. When a midshipman, I was officer of a gig with sliding-gunter masts, which I then thought very defective; and thus I became prejudiced; but the handiness of the rig must have improved since then. For a sail boat nothing can compare with the Chinese rig; but the masts are inconveniently long; the sails when stowed occupy too much space. In the Chinese rig, the act of lowering the sail reefs it; it has no points to tie; and making more sail is done by simply hoisting it, having no points to cast off.

JOHN RODGERS.

PROFESSIONAL NOTES.

These Articles have not been read before the Institute, but are inserted by direction of the Executive Committee.

THE EMPLOYMENT OF TORPEDOES IN STEAM LAUNCHES AGAINST MEN OF WAR.

By Lieut. Charles Chabaud Arnault.*

Translated by Lieut. T. B. M. Mason, U. S. N.,

In May, 1874, the author published an article entitled "Heavy Guns, Armor, and the Ram in Naval Actions," in which it was stated that the discussion of the torpedo was omitted, as it had hitherto played such an unimportant part in actual warfare. Since that date the Turco-Russian war has at least given several instances of the value of torpedoes when used by steam launches, although their necessity as an arm for sea going vessels is still one of theory. Commander Chardonneau has published† an interesting account—collected from official documents—of the operations of the Russian steam launches, and while it is greatly to be regretted that the Turkish authorities have not given us some facts concerning the torpedo attacks against their ships, I have been able to gain a certain amount of information from the latter source, which has materially assisted me in the compilation of the following pages. These later engagements, united to the earlier and crude attempts made by the steam launches of both parties during the American civil war will perhaps give us enough data from which to draw a few practical lessons for future use.

The subject may be divided into two heads. First, a list of the various attacks in which the launch and torpedoes have been used as a means of attack. Second, the inferences which may be drawn from those attacks.

The following are detailed accounts of the most important engagements in which launches and torpedoes have been used.

I. Destruction of the Housatonic, night of February 17th, 1864.—During the year 1863, the Confederates constructed several launches having the exterior form of a cigar, and known in America

* Revue Maritime et Coloniale Vol. 62, No. 214.

† Revue Maritime et Coloniale, April and November, 1878.

by the name of "davids." These boats were intended to attack the Federal vessels by means of spar-torpedoes. One of these, constructed at Charleston, could be entirely immersed at the moment of attack. She was propelled by a screw worked by hand, her crew consisting of eight men. On the occasion of her first trial, under Lieutenant Payne, one of the enemy's vessels passed close to her without discovering her, and the swell caused by the paddles of the ship sent her to the bottom; Lieutenant Payne alone escaped. This intrepid officer did not lose courage, but induced eight men to accompany him again in his boat, which had been raised. A squall caused a similar accident to the first. Payne and two sailors escaped death. The sub-marine vessel was again raised, and during some further trials she plunged and did not re-appear. Payne perished this time with all his crew. After these three similar catastrophies Lieutenant Dixon found eight men sufficiently courageous to man this same boat which had again been raised from the bottom of Cooper river.

"On the 17th of February", writes the author of a very interesting study on the war of secession, "the Federal Corvette Housatonic was anchored off Charleston on the outer line of the blockade. At about 8.45 P. M., it being dark, the officer of the watch saw a black object approaching the vessel at a distance of about one hundred yards; it appeared like a plank sliding through the water, came directly for the corvette, and in two minutes was alongside. In the meantime the chain had been slipped, the engine backed, and the crew called to quarters. About a minute afterwards, an explosion took place, and the ship, settling by the stern, careened to port and went down. Fortunately the weather was fine and the depth of water not very great; the crew, with the exception of two officers and some few men, took to the rigging and were taken off by the boats of the Canandaigua." Dixon was, therefore, the first to use a spar torpedo. His sub-marine boat disappeared however, with all on board, never to rise again.

II. Unsuccessful night attack against several federal frigates.—"Other unsuccessful attacks," continues the author already quoted, "were made against the Union ships. The first was directed against the ironclad frigate New Ironsides by a Secessionist lieutenant, who attacked her at night off Charleston in a small cigar boat. Although he got alongside without being seen and exploded his torpedo, the only losses were the death of the officer of the watch of the Ironsides, and the sinking of the boat by the column of water which her torpedo raised. The frigates Minnesota, Wabash and Memphis

were in turn attacked by cigar boats carrying spar-torpedoes but they escaped injury on account of their extreme vigilance. Thus we see that the "davids" used by the Secessionists in these different attacks were no longer sub-marine vessels like that of lieutenant Dixon, but very small fusiform steam launches.

III. Destruction of the Albemarle, night of October 27th, 1864.—Towards the end of 1864, the town of Plymouth, situated on the banks of the river Roanoke, was in possession of the Secessionists and besieged by the Federal forces. A Confederate ram, the Albemarle, protected it from all attacks from the river. This vessel was made fast to a wharf, doubly protected by a battery and a stockade of floating timbers which formed a circle round her at a distance of ten yards. A young officer of the Union Navy, Lieutenant Cushing, volunteered to destroy the Albemarle in a steam launch fitted with a spar-torpedo. During the night of October 27th, 1864, he steamed up the Roanoke, and on approaching the ram, a heavy small arm fire was opened upon him; his launch, which has going at full speed, slid up on the stockade. Lieutenant Cushing working with his own hands the spar of the torpedo pushed it under the counter of the Albemarle, and fired it by means of a friction primer. The explosion of the torpedo, or more probably the shot fired from the ram, sank the Federal launch; but the Albemarle went down almost at the same time. Lieutenant Cushing, who saved himself by swimming, succeeded in forcing his way through the woods and rejoined the Union army.

Such were the remarkable actions in which, during the American war, torpedoes were used as offensive weapons in boats. We will now cite similar events which marked the late struggle between Russia and the Ottoman empire.

At the outbreak of hostilities the Turks had, on the Danube, three monitors, five iron clad and six unarmored gunboats; in the Black sea, two frigates and eight corvettes, all ironclad, besides a number of wooden vessels. The Russians had not a single formidable vessel to oppose this numerous fleet, but they had in their Black sea ports about fifteen torpedo boats, mostly on the Thorneycroft system, silent engines, very lightly built, fast, and fitted with water-tight bulkheads. A screw steamer, the Constantine, ceded to the government by the Maritime company of Odessa, was fitted with strong davits to carry and hoist rapidly four of these launches. The Russians also placed upon the Danube a flotilla of torpedo boats, the greater part of which were ordinary steam-launches fitted with a bow torpedo spar.

IV. First Action off Batoum, night of May 12th, 1877.—At ten o'clock at night, the Constantine, being seven miles from Batoum, lowered her four launches, which started immediately for the port. At the time of their arrival there, the Tchesme, commanded by Lieutenant Zatrarevni, led the other boats by about three cables lengths; she was fitted with a divergent torpedo. Zatrarevni, seeing a Turkish ironclad anchored at the mouth of the bay, handled his boat with great ability, and succeeded in striking the stern of the vessel with his torpedo. The torpedo did not explode. I am not certain what class of divergent torpedo was used by the Russians, but it seems that the towing conductor fouled for a moment the screw of the Tchesme, and was stripped, to a small extent, of its non-conducting covering, which prevented the current from passing and exploding the primer. The Turks had been alarmed however; their shore batteries and ships opened on the flotilla with such a heavy fire of great guns and small arms that it was deemed prudent to put to sea at full speed; the Tchesme and the Sinope fortunately succeeded in reaching the neighboring port; the other two were picked up by the Constantine.

V. Destruction of the Seïfi, night of May 25th, 1877.—There were three Turkish vessels lying at anchor, under steam, in the arm of the Danube on which the city of Matchin is situated, the double turreted monitor Seïfi, an iron clad gun boat and a wooden vessel. No chain of obstructions surrounded them, but two picket boats were stationed, one near the Seïfi, and one near the iron clad gun-boat. Four Russian torpedo-boats, started from Braïla, and came up the Matchin arm to attack the Turkish squadron; they were ordinary steam launches, with crews of about ten seamen each. A bullet-proof plate protected the machinery and men, except the helmsman; each was armed with a bow spar torpedo, carrying a heavy exploding charge of gunpowder which could be submerged to a depth of three metres, and was fired by an electric apparatus which could be worked either automatically on contact, or by hand, at will. The sky was cloudy, a light mist was over the river, but the night was not very dark. The Russian boats advanced, hugging close under the banks, and, as they were not provided with silent engines, ran slowly, in order to make the least possible noise. The officer who commanded the Seïfi's picket boat saw them, but became demoralized, and fled without giving the alarm. It was then 2.30 A. M. Having arrived, at less than a cable's length from the Seïfi, Lieutenant Doubasoff, commanding the expedition, headed his launch, the Czarewitch, at full speed for the Seïfi.

It was only now that he was recognized and hailed by the sentries of the enemy. His torpedo struck the hull under the counter and exploded on contact. The Czarewitch, three quarters filled by the water column, backed as quickly as possible under a heavy small-arm fire from the monitor. The latter was settling by the stern, but so slowly that, after a lapse of ten minutes, Doubasoff ordered the launch Zenia to attack her. Lieutenant Chestakoff, who commanded this boat, struck her side and exploded his torpedo by hand. He found some difficulty in backing off, on account of the floating débris caused by the two explosions. Fortunately for him the Seïfi, which had only been able to fire two guns, was now sinking very rapidly: up to the time that she sank entirely her brave crew kept up their small-arm fire. The two other Turkish vessels having slipped their chains opened a well sustained fire from great guns and small arms. A ball having pierced the hull of one of the two Russian launches which had been held in reserve, it was found necessary to run her ashore, where the hole was rapidly plugged, when she followed the other launches. During this gallant exploit, which lasted barely a half hour, the Russians did not lose a man, nor receive a wound.

VI. Affair off Sulina, night of June 10th, 1877. On account of the sensation caused by the loss of the Seïfi the commander-in-chief of the Ottoman fleet, Hobart-Pacha, ordered the vessels under his command to observe the following precautions: 1st, during the night, to keep one watch under arms at quarters; 2d, to have the environs of the ships continually patrolled by launches under steam, or, in default of these, by pulling boats; 3d, to keep the vessels surrounded by obstacles capable of stopping torpedo boats. All these precautions were rigidly observed by the crews of the Turkish iron clad corvettes and a despatch boat at anchor off Sulina, during the night of June 10th, 1877. The obstacles which surrounded these vessels consisted of parallel ropes, similar to clothes gantlines. These were stretched between two boats securely anchored, and were floated by means of small buoys which were placed at intervals along the upper line so that it was held just below the surface of the water, the other lines being vertically under it. The Russians affirm that one of the Turkish vessels was under steam, but their adversaries make no mention of this fact. The iron clad corvette Idjalieh was anchored at the head of the squadron.

The Constantine left Odessa June 10th with three torpedo-boats hoisted to her davits and three others in tow. She stopped, the next night, five miles off Sulina. At half past one in the morning the tor-

pedo boats, divided into two groups, headed for the harbor. In advance steamed the Tchesme commanded by Lieutenant Zatrarevni, chief of the expedition. She was provided with a diverging torpedo, and was followed by launches No. 1 and No. 2, each fitted with spar torpedoes, and commanded by Lieutenants Poustchine and Rojdestvenski. The night was so dark that notwithstanding the precautions taken by the Turks the Russian boats came within one hundred metres of their ships, without being perceived. Zatrarevni made a circle in order to work his diverging torpedo against the Idjalieh, but the towing conductor fouled in the screw of the Tchesme and she had to give up her share in the combat.

According to Commander Chardonneau's account, torpedo-boat No. 2 attacked the Idjalieh, whilst No. 1 pushed for another vessel: but all the information from Turkish sources agrees in designating the Idjalieh as also the object of Lieutenant Poustchine's attack; besides none of them state that any other vessel had to repulse the Russian attack. It is therefore almost certain that the Idjalieh was the sole antagonist of both torpedo boats. No. 2, going at full speed, pushed over the obstructions surrounding the Turkish vessel, and her torpedo exploded by contact; it is probable that it struck some object before reaching the hull of the Idjalieh, or was struck by a projectile which fired its primer, as the explosion caused no injury to the enemy's vessel. The Turks in their report do not even mention the fact. However the case may be, the column of water filled the forward compartment of No. 2, thus altering her line of flotation by reducing the draft of her after part, which permitted her to pass easily over the obstructions by reversing her engines. The Turks having opened a heavy great gun and small arm fire, No. 1 was at first, checked by the obstructions, but finally succeeded in pushing through the ropes. Lieut. Poustchine was prepared in person to fire the torpedo by hand if the automatic apparatus did not work, but the explosion took place unexpectedly before the spar touched the hull of the enemy's vessel, and the Idjalieh was only subjected to some slight injuries. It appears that the sailor whose duty it was to submerge the torpedo became demoralized by the enemy's fire and did not sink it below the surface of the water, in which position it was struck and exploded by a bullet. Lieut. Poustchine withdrew his boat, which had been so much injured that he was forced to abandon her. He and his crew of six men sustained themselves in the water by means of their *life-belts*, and at day light they were picked up by the Turkish boats.

The second group of Russian torpedo boats which had taken no part in the action, and the Tchesme and No. 2, rejoined the Constantine without the loss of a single man.

VII. Day attack near Roustchouk, June 20th, 1877.—In order to close the navigation of the Danube to the Turks, the Russians had established, at several points, lines of fixed torpedoes. During the morning of June 20th six of their launches were engaged in establishing a line near Roustchouck, when the sudden appearance of a Turkish ironclad from that place caused them to take refuge in the sedge along the shore. The launch Choutka, commanded by Lieut. Skrydloff, provided with a spar torpedo, now steamed out at full speed and struck the enemy's vessel abeam, in the face of a heavy fire. The torpedo did not explode, as the conductor had been cut by bullets in two places. The bow of the Choutka was pierced by a bullet or a canister ball, but the boat going at full speed managed to escape. Skrydloff and four of his companions were wounded.

VIII. Day attack near Nicopoli, June 23d, 1877.—A Turkish monitor, commanded by an English officer, came out of Nicopoli and steamed down the Danube. Two steam launches armed with spar torpedoes were on the look out for her, hidden behind a small island. They charged her at full speed. The monitor quickly lowered a net all around her, which was attached to the end of booms, on the extremity of which were torpedoes. She opened at the same time with a heavy great-gun and small-arm fire. One of the Russian boats, the Mina, had her conductor cut and received other injuries, which forced her to haul off. The other, the Choutka, commanded by Ensign Nitoff, vainly endeavored to reach the enemy's hull; stopped by the booms and nets, struck by a shell, almost driven on shore by the monitor, it was with great difficulty that she escaped; and, although the men were protected by sheet iron screens, four or five were wounded.

IX. Affair at Soukoum-Kale, night of August 23, 1877.—A casual reading of Commander Chardonneau's description of this fight led me to the belief that the Russian launches were armed with spar-torpedoes, but a note inserted by Commander Chardonneau in the November number of the *Revue Mar. et Col.*, as well as the report of Captain Markaroff, of the Constantine, and certain information from Turkish sources, go to prove that the Russians used diverging torpedoes against the Assar-i-Chefket on this occasion. The action was undoubtedly very close, as one of the boats was half filled with water, and another was nearly sunk while approaching the Turkish vessel.

Taking advantage of an eclipse, on the night of August 23d, the Constantine stopped six miles from Soukoum-Kale. Turkish ironclads often anchored off this place, but recently occupied by the Turks. The four torpedo-launches of the Constantine, commanded by Lieutenant Zatrarevni, got under way and waited for the moment of the eclipse, to enter the harbor of Soukoum. About two o'clock in the morning they made out a Turkish ironclad at the anchorage. This was the corvette, Assar-i-Chefket, commanded by a gallant officer, who had served some time in the English service. The lookout was admirable on board this vessel; several boats were ready to give the alarm and large fires were burning on shore, and illuminating the bay. The Russian launches were therefore quickly opened on by a sharp fire both from the Assar-i-Chefket and the shore batteries of Soukoum. Notwithstanding these drawbacks the Sinope and Navarino succeeded, if we credit the reports of the commanding officers, in exploding their torpedoes against the starboard side of the ironclad. The crew of a Turkish boat lying alongside of the Assar-i-Chefket became engaged for a few moments in a hand to hand fight, using their oars as weapons, with the crew of the Sinope. The Navarino was half filled by the column of water from her torpedo. The Russian launches, Tchesme and Mina, had headed for another vessel, but finding that it was a merchant brig they returned to the Assar-i-Chefket. The Mina exploded her torpedo against the starboard quarter of the ironclad. The Tchesme attempted the same manœuvre, but the rolling of the vessel, caused by the Mina's explosion, almost crushed her. The Russian boats rejoined the Constantine at full speed. This attempt, it is said, cost them only one wounded man.

Such is the account of the combat off Soukoum from Russian sources. The Assar-i-Chafket was, however, little injured, for after a stay at Constantinople from August 31st to September 12th, she was again under way to cruise in the Adriatic. Her captain still further asserts that on the night of August 23d, only one of the torpedoes directed against him exploded, and that even that one was not in contact with his vessel.

X. Second affair off Batoum, night of December 27, 1877.—Towards ten o'clock at night, the Constantine stopped five miles from Batoum and lowered her boats. The night was very dark, a light rain was falling, and there was a very moderate swell. Lieutenant Zatrarevni, who had as usual command of the Russian boats, had considerable difficulty in finding his way in the darkness. At midnight he rounded

Batoum point and discovered two ironclads lying at single anchor, heads to seaward, sterns secured to the shore. No chains of obstructions or guard boats were visible. The launches Tchesme and Sinope had each a Whitehead torpedo, the former had her firing tube arranged fore and aft under her keel; the other had her's attached to a float which she towed. When at a distance of about sixty metres from the nearest Turkish iron clad, the two boats fired their torpedoes almost simultaneously: that of the Tchesme exploded abeam of the vessel; its course could be easily traced in the sea; that of the Sinope appeared to strike the stern of the vessel. The Turkish ships and batteries at last opening fire on the Russian boats they rejoined the Constantine at full speed, the Tchesme letting go her torpedo tube in order not to retard her movements. The Turkish vessel attacked received no serious damage. Commander Chardonneau thinks that the Tchesme's torpedo struck a rock and that the Sinope's failed to explode. It seems possible that the torpedoes were exploded by submarine obstructions.

XI. Third affair off Batoum; destruction of a Turkish ship during the night of January 25th, 1878—At half past eleven P. M., Captain Makaroff of the Constantine again stopped five miles from Batoum and lowered his launches. The boats were in command of Lieutenant Zatrarevni. The Tchesme and Sinope were armed with Whitehead torpedoes. The weather was thick, but at two in the morning the moon rose and allowed the Russians to see plainly the vessels at anchor off Batoum. One of these was an unarmored cruiser, of from twelve hundred to fifteen hundred tons, anchored in the mouth of the harbor. The Tchesme and Sinope headed for her, and at a distance of seventy-five metres abeam of her, fired their Whiteheads together. Both exploded, and in less than three minutes the Turkish ship disappeared. The Russian launches rejoined the Constantine in safety.

In order to draw useful inferences from the events of past wars, it is necessary to take into account the relative worth of the personnel and materiel engaged in each encounter. A victory of intelligently organized forces over barbarians without discipline and without efficient weapons proves nothing from a military point of view; a success owed, by the soldiers or sailors of a powerful nation, to the employment of perfected contrivances, against adversaries equally formidable, furnishes almost always examples worth studying. In regard to the subject in hand, it is certain, that, during the last two years of the

great American war, that is to say at the period of the destruction of the Housatonic and the Albermarle, both the Union and Confederate forces had seamen heroically devoted, perfectly acquainted with the details of their profession, and provided with weapons, which though often of recent invention, were none the less formidable in their hands. We have dwelt upon the strange career of the sub-marine boat commanded successively by Lieutenants Payne and Dixon in order to prove to what an extreme point some men in America carried their devotion.

In the Turco-Russian war the belligerents both merit the utmost consideration; for while the Russian seamen displayed the greatest bravery and audacious intelligence in handling their torpedo boats, the courage and devotion of the Turks was equally notable. These traits were especially shown by the latter when the Seïfi was struck by a torpedo, her crew remaining at their quarters and firing a last shot as their vessel sank beneath them. The unenviable reputation, for lack of vigilance, gained by the Osmons at Matchin and Batoum, was cancelled at Sulina and Soukoum-Kale, where the organizing power of Hobart-Pacha and his English associates was more immediately felt. On the Black sea as well as on the Danube, the Russians found their enemy no mean antagonist.

This much being established, let us examine the events which we have cited. When, the Americans first employed the torpedo in boats as an offensive weapon, three dangers, seemed to threaten their loss. If the direct effect of the water hammer did not crush their hulls, or the column of water raised by the explosion did not fill them, putting out their fires, how could they possibly escape the hail of bullets, canister, and shot sent against them by a vigilant enemy. After the destruction of the sub-marine vessel commanded by Lieutenant Dixon, of the steam launch commanded by Lieutenant Cushing, and of the "david" which attempted the destruction of the Ironsides every torpedo boat sent against an enemy was considered as sacrificed in advance. Soon, however, numerous experiments proved that a properly constructed torpedo boat had nothing to fear from the water hammer or the column of water. The actions of Matchin, Sulina, and of Soukoum-Kale fully confirm these results. In fact, though several of the launches used by the Russians, notably at Matchin, were far from offering the same certainty of dryness as is now found in the fine boats specially constructed for torpedo work; none of them sank from the effects of the explosion of the weapon they carried. If the sub-marine boat of Lieutenant Dixon and the "david" sent against the Ironsides were less fortunate,

it can be attributed to faulty construction. Lieutenant Cushing's launch, was sunk undoubtedly by a shot from the Albemarle.

The fire of the guns, mitrailleurs, and small-arms of the enemy are the real dangers which a torpedo boat has most to fear. Before the Turco-Russian war, this danger was considered so serious that the efficacy, not only of a day attack against vessels underway, but even of a night attack against vessels at anchor was doubted.

It may now be admitted, however, that in none of these attacks a properly constructed torpedo boat would have run exceptional dangers. What in fact do the preceding actions teach us? Setting aside the boats not directly engaged, and, omitting also the two American boats which were victims solely to their bad construction, we see, that during the Turco-Russian and American wars, sixteen torpedo boats attacked vessels of the enemy. Of these sixteen boats, two only were destroyed; Lieut. Cushing's launch and Lieutenant Poustchine's cutter; the latter officer claims to have sunk his boat with his own hands, as damage to his machinery would have caused her inevitable capture by the enemy. Again, many of the Russian attacks were made under most unfavorable circumstances; near Matchin, the launch Zenia remained immovable for ten minutes under a galling fire from the Seïfi before she attacked the monitor; at the Sulina fight, torpedo boats, No's 1 and 2, after having pushed over the obstructions, took some time to clear themselves from the wreck; off Soukoum, the four boats which were attacking the Assar-i-Chefket were seen at quite a distance by the Turks. But all this amounts to nothing when compared with the temerity shown by the Russians in broad day light at the Roustchouk and Nicopoli affairs. Their officers claim that in the second attack the Choutka was exposed for an hour to the fire of her adversary, a well armed, well commanded monitor—nevertheless the Choutka suceeeded in escaping, as did her mate the Mina, and the torpedo boats employed at Matchin, before Soulina and Soukoum-Kale.

Recent experiments prove that a fast steam cutter, pierced by one or more projectiles the size of canister balls, is not in danger of sinking if kept at full speed. This fact was confirmed at Roustchouk and at Nicopoli, the Choutka being pierced by projectiles of some size; in both cases, however, she was kept above water by her speed. Near Matchin the Russian launch, Djiguite, having but little speed, was struck by a ball in her stern; she was however run on the beach when the hole was stopped in a few minutes.

Would the crew of a torpedo-boat be more exposed to bullets, canister, and balls than her hull? An examination of the different combats of the Turco-Russian war will give us an answer to this question. Let us first take the night actions: The only casualty which occurred in the eleven torpedo boats, which (not counting the boats which were themselves destroyed,) attacked the enemy, was one man wounded. In the somewhat prolonged actions of Matchin and Sulina not a single Russian was touched by Turkish projectiles, notwithstanding the fact that the launches commanded by Lieutenants Doubasoff and Zatrarevni were only protected by very light shields or turtle-backs.

In each of the day affairs at Roustchouk and at Nicopoli, the assailants had four or five wounded. But there again they were but poorly protected from bullets. It is almost a miracle that the Choutka and her crew escaped, on June 23d, from the continuous and prolonged fire of the monitor which she had attacked with such great temerity. The gunners of the vessels were perhaps not well drilled, but their small-arm men have never been thought below the general average, and some of the vessels—especially those commanded by English officers—proved during the war that they were capable of excellent work. Therefore, experience proves to-day that a day or night attack attempted by a well constructed torpedo-boat, against a vessel at anchor, does not present exceptional dangers for the boat or her crew.

In all coast-wise wars torpedo-boats may be employed but will they really be of great use? The first part of this article shows us that in fourteen attacks, made by torpedo boats, four caused the destruction of vessels, three caused more or less severe losses to the enemy, the others appear to have produced no results. Now in each of the affairs, the personnel and materiel exposed by the assailants to the attack of the enemy were very inconsiderable; ten or twenty men, one or more launches worth all together from three thousand to twenty thousand dollars. This small force succeeded once in every three attempts in destroying a ship manned by hundreds of men and whose cost would be figured in the millions. Is not such a result conclusive?

Let us also see under what circumstances the attacks already enumerated were made. The torpedo-boats used during the American war were, as has already been stated, all singularly defective; but many of the Russian boats used in the last struggle left much to be desired. Were the torpedoes used by the assailants always of the best type? No, because the diverging torpedo used by the Tchesme at the first affair off Batoum could not be fired; while at Soukoum the

explosion of the torpedoes—probably of similar construction—caused but insignificant damage to the Turkish iron-clad Assar-i-Chafket.

Another question. The Russian crews were excellent, but did their torpedo-boats always manœuvre in the most judicious manner? At the first action off Matchin, four launches were under the orders of Lieut. Zatrarevni. Only one, the Tchesme, tried to use her torpedo. This attack was therefore of little importance. If all the boats had rushed together against the Turkish ironclad which was attacked by the Tchesme, would the result have been the same? On the Danube, near Matchin, Lieutenant Doubasoff's intention was to fight successively each of the enemy's ships, only bringing one boat at a time into action; for this reason three of them remained immovable under the Turkish fire for ten minutes. Would it not have been more certain and less dangerous to have attacked simultaneously the Seïfi, with the Czarwitch and the Xenia; and the Ottoman ironclad gunboat with the other two torpedo boats? It is only necessary to read the account of the Sulina fight to see that, in this case, the plans of the Russian officers were not correct. The only night attacks made during the last war, which seem above criticism were those against the Assar-i-Chefket and the vessel sunk at Batoum.

The Roustchouk and Nicopoli actions seem to deserve special attention. An attack of this nature, made against a vessel under steam, in broad daylight, has not at all the same character as a night attack. In the latter, the first object of the assailants is to surprise the ship when she is immovable; a single boat is all that is absolutely necessary to insure success,—the destruction of the Housatonic, and the Albemarle prove this beyond doubt; in the former, on the contrary, it is necessary to attack an enemy on his guard, who can see his adversaries at a great distance and can manœuvre rapidly: several torpedo-boats should then unite their efforts against a single vessel in order to divide its attention and increase their individual chances of success. The attacks of the Choutka and Mina were therefore almost fatally condemned to failure, because in an action like that of Roustchouk or Nicopoli the united efforts of at least four boats would seem necessary.

Thus, the American and Russian torpedo boats fought the greater part of their actions under conditions which were unfavorable to them; this consideration shows, more than anything, the great practical worth of an arm which has registered in actual engagements one great success for every two defeats.

We have seen that in the actions of Roustchouk and of Nicopoli,

the Russians had four or five wounded: in nearly all the night attacks on the contrary they did not have a single seaman hurt by the fire of the enemy. This fact shows that, although at night ordinary steam launches can be used to surprise a vessel in the darkness, for day work special boats are necessary, having great speed, easily turned, presenting as small a target as possible to the enemy and having their crews absolutely protected against small-arm fire. Balls and canister may pierce the boat; but from the experience gained at Roustchouk and Nicopoli, we know that if the machinery remains uninjured she can escape at full speed, Therefore, lightness of hull, rapidity of movement and turning, small dimensions, and protection against small-arm fire, (limited to the machinery and fighting stations of the men) would appear to be principal requisites for a torpedo boat.

Approaching our subject still more closely, we will now try to determine the kind of torpedo which should be used with boats.

At the first affair at Batoum and off Sulina, the Tchesme attempted vainly to make use of a diverging torpedo. If, as seems probable, the Assar-i-Chefket was attacked with torpedoes of the same system, the harmlessness of the three explosives would singularly increase the reasons which militate against their use. The captain of the Turkish ironclad, as we have already said, states moreover that only one of the Russian torpedoes exploded. This contradiction in the accounts of the Soukoum affair is not surprising, as in the midst of darkness and the noise of broadsides and small arms, the assailants could well have mistaken the discharge of a heavy gun for that of a torpedo exploding forty metres from their boats. On the other hand the attacked party, under the same circumstances, might not have heard the noise of the explosions. We do not know what system of igniting was fitted to the torpedoes used by the Russians against the Assar-i-Chefket, but admitting the exactness of the Russian information, how can we explain the harmlessness of the three explosions? Was the Turkish vessel protected by a chain, or belt of floating logs, placed at some metres from her hull and against which the enemy's torpedoes struck and exploded? There is no documentary evidence to support this supposition. However it may be, the want of success of the Tchesme's diverging torpedoes is sufficient to cause the rejection of this kind for boat service. We have also seen that they become, for the assailing boat, a cause of delay and danger, embarrass her movements, in fact place her in a most critical position under the fire of the enemy, inconveniences which are not compensated for by even the best chances of success. The least obstruc-

tion stops the diverging torpedo; a few lines stretched between booms would change its direction and preserve the vessel from all danger. This reasoning, supported by the experiences of the Turco-Russian war, leads us to completely reject the diverging torpedo for boat use.

The actions which we have cited in the beginning of this essay give us three complete successes in ten attacks made with spar torpedoes. But, as we have seen, the torpedo cutters used by the Americans were very defective, and the actions at Roustchouk and Nicopoli were carried on under very unfavorable conditions for the assailants. The destruction of the Housatonic and of the Seïfi shows that the spar torpedo is, at night, a terribly efficient arm against vessels at anchor unprotected by an exterior belt of obstructions; that of the Albemarle, and even the action of Sulina prove that sometimes even that defense is insufficient. We know, in fact, that on the night of June 10, 1877, the Russian launches, commanded by Lieutenants Rojdestvensky and Poustchine, pushed over the obstructions which surrounded the Idjalieh. If their torpedoes did not destroy that vessel, it was because they were struck by shot, or because they struck some obstacle placed by the Turks inside of the obstructions. These obstructions were, probably, the primary cause of the Russian failure, delaying the boats for some minutes under the fire of the Idjalieh and producing amongst them a momentary demoralization which prevented their handling their torpedoes with the necessary coolness. Again, no matter how quickly the spar is worked, it will always be most difficult to submerge it in the short space of time occupied by the passage from the obstruction to the vessel. In the Nicopoli affair also, the nets and booms presented an unsurpassable obstruction to Lieutenant Niloff's boat. Relative weakness against vessels defended by exterior obstructions is the principal objection that can be made against the spar torpedo.

The Russians attribute the premature explosion of the two torpedoes which they used against the Idjalieh to the shock given by a projectile; while official reports from Roustchouk and Nicopoli state that the torpedoes of the Choutka and Mina could not be ignited, because their conductors had been shot away. An explanation for these four failures, may probably be found in the faulty construction of the torpedoes themselves, in the hurry of the moment, or in some mismanagement committed under the enemy's fire. In fact experiments prove that the shock of bullets or canister balls can only ignite a torpedo when the cap is directly struck, furthermore two wire conductors are a very small target for small-arms; nothing prevents even these from

being protected in the spar of the torpedo. If we place entire confidence in the Russian reports, a truly extraordinary chance caused, on four different occasions, accidents which the fallibility of man, even of the ablest and bravest, explains much more readily. We cannot therefore consider the accidents to which the enemy's fire exposes spar torpedoes as a serious objection to their use.

Unfortunately we have only been able to give two actions in which the assailants used the Whitehead torpedo; one of these was a failure, the other a complete success for the Russians.

What were the real facts on the occasion of the second action off Batoum? Commander Chardonneau thinks that the Whitehead of the Tchesme struck a rock; but, since that torpedo was fired at a distance of only sixty metres from the Turkish ironclad, it would be necessary to suppose that that vessel must have been very close herself to the danger; the least change in her position would have put her on it. It is not probable that her captain would have chosen, in the vast harbor of Batoum, such a perilous anchorage. Shall we suppose that the Russian torpedoes met some sub-marine obstructions placed by the enemy? The Turks might very possibly have attempted some such system of defense, but no document has ever been adduced to support this theory.

It therefore becomes necessary to look elsewhere for an explanation of the Russian want of success. Now, when they made their attack, the night was very dark; therefore they might have made considerable error in regard to the distance which separated them from the enemy. All seamen know that on a dark night a large vessel often appears immeasurably larger in every way than she really is. The Russian officers state that they were able to see, on the water, the track of the torpedo from the Tchesme to off the beam of the Turkish vessel where it exploded, but the arrangement of the mechanism of the Whitehead is such a delicate operation, that, the trajectory of the torpedo does not always follow a straight course. It is, therefore, very possible that the Russians fired their torpedoes at a greater range than sixty metres from the Turkish ironclad and that the latter describing a curve, passed astern of the vessel striking the rocks, off the neighboring shore. This supposition seems still more admissible from the fact that the Russian officers state in their reports that the Sinope's Whitehead took the direction of the stern of the Turk. The arrangements fitted for firing the torpedoes from the Tchesme and Sinope were, moreover, probably defective; a movable tube under the keel of the cutter, or the expedient of an auxiliary raft, does not seem a very convenient method of

pointing the Whitehead. Whether the Russians modified these arrangements before the third affair at Batoum, is not known, but the rapidity with which the Turkish vessel sank leads us to believe that the Whiteheads, fired on this occasion from the Tchesme and Sinope, both reached the object against which they were directed.

On the Danube, the Russians did not attempt to use the Whitehead, as any body of water with a strong current or tide is very unfavorable to the action of this torpedo, both boats and torpedoes being subjected to many exterior influences which go to destroy all accuracy of fire, while even a rough sea makes the firing of a Whitehead a delicate and sometimes impossible operation in an open roadstead; the difference in density between salt and fresh water renders new adjustments necessary in ascending rivers. Therefore, deviations arising from an incorrect appreciation of distance, a faulty regulation of the rudder, a false trajectory—caused by exterior influences acting on the direction, or immersion of the torpedo, are grave objections inherent to the Whitehead.

The following deductions concerning the employment of spar and Whitehead torpedoes are based upon the experiences from the use of these weapons during the Turco-Russian war.

When a vessel is anchored in a strong current, it is very difficult to establish a belt of floating obstructions about her, or even a defensive system with swinging booms and nets attached to her hull. We have just observed that similar circumstances, especially on a dark night with a rough sea, also render the firing of the Whitehead very uncertain. Spar torpedoes should then be used in preference; the darkness will moreover allow the launches to avoid, with greater ease, the watchfulness of the guard boats and the sentries of the enemy's vessel. When, on the contrary, the night is not too dark; when the sea is calm and the feebleness of the current has allowed the attacked vessel to surround herself with exterior defenses, the use of the Whitehead presents splendid chances of success which it would be impossible to ask of spar-torpedoes. The opportunity of attacking a vessel underway, with torpedo-boats, may occur at night as well as during the day. No action pleads for nor against the Whitehead under these circumstances. But the affair of Nicopoli shows that a vessel, having poor speed, can protect herself efficiently, against the explosion of torpedoes, by means of a system of swinging booms and nets. The use of the Whitehead in this case is clearly indicated. We must remember, however, that the speed of the enemy's vessel adds considerably to the exterior causes

which render the use of the Whitehead from boats very uncertain. In conclusion, until further investigation, it would seem wise to place in the flotillas intended for coast defense some launches armed with spar torpedoes, and others with Whiteheads. Finally, the following simile seems appropriate: the spar torpedo is a dagger which a determined man, at the peril of his own life, strikes into the heart of his enemy which even a solid coat of mail will not protect; the Whitehead torpedo is the perfected projectile, which, being easily fired from a distance, kills the enemy which it strikes, but very often misses its mark and is uselessly lost in the distance.

Up to the present we have only enumerated torpedo-boat combats from the side of the attack; let us see if they offer any useful points in regard to the defence. If the Minnesota, the Wabash, and the Memphis were neither sunk nor seriously injured by the "davids" of the Confederates it was owing to the extreme vigilance of their crews; but the Housatonic, which was also on her guard, as she slipped her chain at the instant of the explosion, was nevertheless destroyed by Lieutenant Dixon's torpedo boat. The Turkish vessels anchored near Matchin and off Soukoum-Kale had guard boats; notwithstanding, the Seïfi was sunk, and the Assar-i-Chefket only escaped because the torpedo did not act properly. It is therefore evident, that, the greatest vigilance is not always a sufficient guarantee against the attack of torpedo-boats. All the actions which we have reviewed show the decided insufficiency in such cases of a defense depending entirely on great-gun and small arm fire. On the other hand, if the Albemarle was sunk in spite of her surrounding obstructions, we have the simple rope protection of the Idjalieh frustrating entirely the Russian attack, and also the fact, that the monitor attacked off Nicopoli owed her salvation to the swinging booms and nets attached to her hull. To the use of such systems of defense the objection is raised of the necessity of a vessel threatened by torpedo boats always being ready to get underway; the example of the Housatonic proves however that the last mentioned method is not sufficient to withdraw a vessel from the torpedo of a fast cutter. Would the getting underway of a vessel be impeded by a system of swinging booms and nets placed around the hull? No: because the Turkish monitor, attacked off Nicopoli, used this means of defence, even when she was underway. We cannot lay too much stress on such an example, which demonstrated practically the possibility of defending exteriorly the hull of a vessel under steam, and consequently the necessity of giving serious attention to this sub-

ject. We know that at sea, even at slow speed, the use of nets and swinging booms would be impossible; but it will generally occur that a vessel will have to defend herself in this way in rivers, passes and harbors, where the water is generally smooth.

When not provided with swinging booms and nets fastened to the hull, a vessel at anchor can, under certain circumstances, protect herself efficiently by means of obstructions made fast to boats or to buoys anchored around her. It was thus that the Turkish obstructions at Sulina foiled the attempts of the Russian torpedo-boats. The Ottoman ships collected at Batoum were in an excellent position to have followed this method. Their bows being secured by anchors to seaward, and their sterns being moored to the shore, they had every facility for establishing a good line of obstructions some metres from their hulls. It is evident that a vessel at anchor in variable currents and winds, where she would swing about her anchor, could not use this system on account of the great space required to be kept clear.

For these reasons the events of the Turco-Russian war seem to indicate the following methods as most advantageous in protecting ships against the attack of torpedo-boats, combining them according to circumstances: one watch sleeping at quarters during the night; mitrailleurs and light guns, in as great numbers as possible, loaded and aimed beforehand; the engine with steam up and ready to move, and the cables ready to slip; a system of swinging booms and nets secured to the hull; obstructions similar to those used by the Turks at Sulina; the guard boats at these obstructions to be armed with mitrailleurs or guns; finally, at a distance of at least one hundred metres from each beam, steam launches under way. It would be the duty of these launches to give the alarm, and to rush at full speed against the enemy before he could use the Whiteheads. A vessel protected in this way would not be invincible, but she would have, we think, a great many chances on her side.

Finally, an examination of the actions cited above lead us to the following conclusions:—

First, the attacks made by torpedo-boats against ships during the American War of Secession, and the late struggle between Turkey and Russia, took place under such circumstances that their results should be taken into serious consideration; these results appear to establish the following facts. Second, the danger to a torpedo-boat attacking a vessel has been greatly over-estimated. Third, such an attack, even when the assailant makes use of comparatively insignificant means,

offers sufficient chance of success to be always attempted when the opportunity occurs. Fourth, a single torpedo cutter, of inferior quality, is sufficient to surprise a vessel at anchor at night; a day attack against a vessel under way requires the co-operation of several torpedo boats of special construction. Fifth, under all circumstances, where such boats, formed into flotillas, have to attack one or more vessels, the attack should be simultaneous. Sixth, the use of divergent torpedoes in boats should be rejected. Seventh, in a dark night, or with a rough sea, spar torpedoes can be usefully employed for attacking a vessel at anchor, in a strong current, or one which may be supposed to be without good exterior defenses. Eighth, Whitehead torpedoes should be employed in preference, on a clear night, where the sea is smooth, or the current feeble, and when the vessel is supposed to be protected by obstructions. Ninth, against a vessel under way both of these systems of torpedoes can be employed, according to circumstances; it would therefore seem proper to embody in the flotillas intended for harbor and coast defense spar-bearing and torpedo-firing launches. Tenth, whenever circumstances will permit, a vessel at anchor should guarantee herself against the attacks of torpedo-boats, not only by good exterior and interior vigilance, but also by obstructions secured to her spars, or by obstacles independent of her hull, or even by using a combination of the two methods. Eleventh, a vessel under way may sometimes be protected by swinging booms and nets.

In closing this article it is scarcely necessary to state that we do not pretend to establish any fixed rules or principles for the use of the torpedo. The weapon is such a new one in warfare that time and circumstances may greatly modify its uses; in the meanwhile we should conscientiously study the actions in which the torpedo has already figured, and profit by the lessons taught by the seamen who first used the arm in actual engagement.

THE TRAINING SHIP MINNESOTA.

Additional remarks of Lieut. B. Noyes on Lieut. Comd'r Chadwick's paper, particularly treating of the system and routine, as carried out on board the Training Ship Minnesota.

In a general way the system on board the Minnesota is as follows: There have been many changes, and will be more, with the experience of the officers, and the present plan, of course, is not satisfactory to all, but it works fairly well.

Boys, accompanied by parents or guardians, appear on board and are sent to the Captain's office. He converses with the boys first, endeavoring to discover their general disposition and antecedents, if they are determined to become sailors, if they come with the idea of becoming officers, and of their own free will; and endeavors to deter those who come with false ideas and bad character. The parent or guardian goes before the clerk, who is Notary Public, and makes oath that he is the lawful parent or guardian, what the boy's age is, and consents to his apprenticeship. By far the greater per cent. of boys who come and stay is from the larger cities. Of a draft of twenty odd from the West, I think not one remains, all having obtained their discharge or deserted. Of colored boys we have very few, and they are of moderate intelligence.

Having gone through the legal forms of apprenticeship orders are sent to the medical officer to examine physically, to the officer of the deck to send over the mast head, and to the Chaplain who examines mentally, according to the form No. 5, the last being with a view to find out whether the boy be a dull, stupid one, or not. When examined by the foregoing the papers are sent to the office, and, if successful, the recruit is sent to the ship's writer, who gives him a slip with his watch, division and gun numbers; thence he goes to the Master-at-arms who puts on his slip his mess and ship number and takes him to the Paymaster's office, where he gets his outfit of clothing, which is examined, as to fit and quality, by the officer of the primary division. The clothing is then marked and put in his bag; he is then taken to the Captain of the after-guard, (in which part of the ship they all begin) who shows

him his billet, how to lash up his hammock, tells him where to come in the morning to wash, &c.

The next morning he begins his routine at quarters, where the orders (No. 3) are read to him. The general idea of a ship's company is followed in laying out the routine, having the after guard and Company Division as a sort of introductory to the rest of the ship's company and routine. Outside the foregoing the boys are watched and stationed precisely similar to an ordinary crew. There are at present about three hundred and twenty boys on board. They are divided into twelve gun's crews; and the Primary Division, variable in size but now about four gun's crews, numbered 13, 14, 15, and 16. The first six gun's crews from the Forecastle and Foretopmen, odd numbered guns Starboard, even Port watch; the second six the Main and Mizzen Topmen. There are about twenty boys in each crew. In all formations for instruction the gun's crews are used as the sections, and the boys again divided by the instructors, according to their merit in the particular branch.

There are three Departments,—Seamanship, Gunnery, and Studies, and extra instruction in signalling, boxing, broadsword, and the use of diving apparatus, an officer in charge of each and the navigator in general charge. Under each officer in charge are instructors; in seamanship two junior officers, two school-masters, and the petty officers; in gunnery two junior officers; and an effort is being made to instruct seamen apprentices who have returned from a cruise, and are willing to re-enlist. In signals, one officer, one school-master who attends to Boxing and Diving and one who attends to cutlass exercise.

It has been found that, even in the winter, a man-of-war of the size of the Minnesota, requires one watch to be on hand to do the work; so all instruction is confined to one watch for the day, the watch on deck (weather permitting) being exercised in seamanship.

The routine of instruction, (No. 6 .), provides for three hours per week for "all hands" in general exercises, as ship's company, (excepting always the Primary Division) such exercise being Monday, great guns, Tuesday, drill as Battalion, ashore. There are seven hours instruction in gunnery, eight hours in seamanship, and eight in studies. For the Primary Division there is the same instruction but different exercise, the first few weeks being devoted, on general exercise days, to "setting up" facings, etc., in order to give the boys a good bearing and enable them to get around; then they have Howitzer Drill as preparatory to great guns. For further instruction the boys are

divided into three classes, senior, all the gun captains (who are also captain of tops,) middle class, all except the primary division boys who are Junior class. The Senior class boys have extra privileges, all recommended by divisional officers subject to approval of executive are not subject to same punishments, and cannot be deprived of position, except after warning and a repetition of offense. They also have choice of ships, if there be any, when drafted. It will be seen by the routine that as many hours are devoted to instruction in seamanship as to any other branch, and in summer the exercises, both general at colors and sunset, and by the watch on deck, when not at work, add very much more.

The instruction in studies consists of geography, history, arithmetic, (through decimal fractions, I believe) and reading, writing and spelling for those deficient. All boys passing a certain examination are excused from studies.

The Instruction in Seamanship.—The boys in each quarter watch (Gun Crews, No., 1, 3, 5, and primary division, 13, or 2, 4, 6, 14 or 7, 9, 11 and 15 or 8, 10, 12 and 16 are divided (each one) into sections according to merit in seamanship, and, once a month, changes are made at formation, when all the instructors are present, and, once a quarter, boys who wish are examined for a higher rating by all the departments. A glance at the section list shows a boy's knowledge.

The instructions for the winter consist in, first; parts of ship and appliances—such as yards, masts, etc.; then in handwork, the ordinary work of knotting, making sennit, putting on straps, that a boy is first called upon to do when he goes on board a ship, there being a constant effort to give him practical rather than theoretical ideas; then marlinspike work, such as would be useful on going aboard the cruiser, then work on monkey yards, under cover, furling and getting yards ready for coming down and going up, then reefing parts of sails, reeving gear, standing rigging, etc., etc. There has been, this winter, much boating, rowing and sailing, and in the spring, work with the mizzen.

In gunnery there is a lack of instructors, which we are endeavoring to supply by educating the seamen apprentices, as I have before said. The instruction consists in teaching parts and uses of implements, of guns, the manual drill, using dummy shell and cartridges, magazines, shot shell, howitzer drill, with a course of aiming drill, and practice at target for the senior class, who have a course of signals, boxing, and cutlass. There is a volunteer class of buglers—all calls for the ship being sounded by them, and we expect to send at least one bugler with

a draft. All howitzer and boat drills are conducted by bugle signals. The instruction with cutlass is given by a schoolmaster assisted by a corps of assistants (seamen apprentices.) There is a higher course of instruction in seamanship, gunnery and target practice for seamen apprentices who return for discharge.

Bag inspections occur twice a week, and one gun's crew of the watch on deck goes to the tailor for instruction in sewing. This inspection is considered very good, not only to keep the bags in order and clothing clean, but to teach habits of order. Each crew has two seamen (petty officers generally) in charge of the clothing of that crew and responsible for such. Boys outside the primary division are excused from inspection after proving themselves neat and orderly with their bags and clothing.

Bag inspection in the primary division is conducted more severely than in the others, that the boys may, at the outset, be taught proper habits with their clothing. Their clothing is all marked in precisely the same spot, rolled neatly, so that the number shows, and strapped twice. When bag inspection takes place the crews divide "as for casting loose," open their bags, take out clothing and "lay out" on the bag, white pieces on one side, blue on the other, in order, number out, the seamen in charge inspect for dirty pieces, then the officer of the division passes along, corrects his clothing list, at a glance telling what is missing in the bags. The tailor goes with him, examines one day their ordinary suit, the next their mustering suit, for needed repairs; takes the names of those whose clothing needs it, and has it repaired that afternoon. The new ones get their stuff for clothing-stops, soap, and bag, and are shown how to make them; then the seamen show how to stow the bags when inspection is over. Boys are anxious to pass from the primary division, and can do so by answering the questions on No. 4 satisfactorily, and having gone through the course; and on transfer they are made second class boys. Each captain of a part of the ship has a small book in which he marks all of his boys once a month on their handiness aloft and general capability, which marks are considered in passing from one grade to another. Such is, in a general way, the system pursued on board the Minnesota. Boys are not allowed to remain long enough to obtain the best results, so we must content ourselves with what can be done in the time generally allotted, say a short year.

FORM NO. 1.

NOTICE TO PARENTS AND GUARDIANS OF CANDIDATES FOR ENLISTMENT IN THE NAVY.

Parents and guardians of candidates residing at a distance from New London should have their sons or wards who wish to enter the U. S. Training Ship examined by a competent physician. Any of the following conditions will be sufficient to cause the rejection of an applicant: —

Greatly retarded development; feeble constitution, inherited or acquired; permanently impaired general health; decided cachexia, diathesis, or predisposition; chronic disease, or results of injuries sufficient to permanently impair efficiency, such as,—

Weak or disordered intellect; epilepsy, or other convulsions, within five years; impaired vision, or chronic disease of the organs of vision; great dulness of hearing, or chronic disease of the ears; chronic nasal catarrh, ozena, polypi, or great enlargement of the tonsils; marked impediment of speech; decided indications of liability to pulmonary disease; chronic cardiac affections; hernia, or retention of testes in inguinal cavity; cirsocele, hydrocele, stricture, fistula, or hemorrhoids; large varicose veins of lower limbs, scrotum, or cord; chronic ulcers; cutaneous and communicable diseases; unnatural curvature of the spine, torticollis, or other deformity; permanent disability of either of the extremities or articulations from any cause. Defective teeth, the loss or extensive caries of four molar teeth will cause the rejection of a candidate.

The following table will show the minimum standard of measurements required for boys at different periods from 15 to 18 years of age: —

Age.	Height.	Weight.	Chest Measure, (over nipples).
15 years.	59 inches.	85 pounds.	$27\frac{1}{2}$ inches.
16 "	61 "	90 "	28 "
17 "	62 "	100 "	29 "
18 "	63 "	110 "	30 "

The candidate must be able to read distinctly, with each eye singly, Snellen's twenty feet test type at a distance of fifteen feet.

Attention will also be paid to the stature of the candidate; and no boy *manifestly* under size for his age will be received on board the ship. In case of doubt about the physical condition of the candidate, any marked deviation from the usual standard of height will add materially to the consideration for rejection.

☞ N. B.—No expense whatever will be allowed by the Government, whether a candidate is accepted or not. ☜

STEPHEN B. LUCE,
Captain U. S. Navy, Commanding.

FORM NO. 2.

BOY'S OUTFIT.

I hereby acknowledge to have received from Paymaster, U. S. Navy, the following articles of clothing, etc., the cost of which to be charged to my account:—

One Pea Jacket,	$10.50	One Bar Soap,	$0.24
Two Woolen Undershirts,	3.60	One Jack Knife,	.69
Two Pairs Woolen Drawers,	3.30	One Scrubbing Brush,	.44
Two Pairs Woolen Socks,	.60	One Shoe Brush,	.50
One Pair Shoes,	2.50	One Comb,	.37
One Mattress,	5.75	One Box Blacking,	.07
One Pair Blankets,	6.24	One Pot, Pan, Spoon and Fork,	.48
One Black Silk Handkerchief,	1.00	D. E. Buttons, Silk, Needles,	.28
Cloth, 1½ yards,	4.88	Making up Duck and Cloth,	2.20
Two Flannel Overshirts,	6.00	One Pair Gloves,	.35
One Pair Satinet Trousers,	3.11	One Tooth Brush,	.25
Cotton Ravens,	2.40		
			$55.69

Signed (by boy).————————

Issued and acknowledged in presence of

———————— Master at Arms.

FORM NO. 3.

U. S. T. S. MINNESOTA, RULES TO BE OBSERVED.

I. Obey orders promptly.

II. Salute Officers, in uniform or citizens' clothes, whether on board ship or on shore, by standing erect and touching the cap.

III. An order from a boy petty-officer must be obeyed as promptly as one from a rated petty-officer. After the order has been complied with, if injustice has been done, the case should be reported to the Executive officer.

IV. Punctual return from leave is one of the first requirements of discipline.

V. Trafficking in clothing is prohibited. Any article of clothing found about the ship must immediately be turned over to the Master-at-arms. A boy found in possession of an article not belonging to him will expose himself to grave suspicion.

VI. Communications with the navy department must pass through the hands of the commanding officer.

VII. Improper language will not be tolerated.

VIII. Advancement and special privileges on board this ship will depend on good conduct and proficiency.

IX. The use of tobacco is strictly prohibited.

Captain S. B. LUCE, U. S. Navy.

New London, Conn., Jan., 1880.

FORM NO. 4.

TO PASS FROM THIRD CLASS TO SECOND CLASS BOYS.

Outfit of clothing and bedding must be complete, marked and in good order; must have passed through the "setting up" exercises, facings, and movements by fours:

Must know:

1. How and when to wash person.
2. " to lash and stow a hammock.
3. " " " " at fire alarm.
4. " " scrub and stop on hammock.

5. How to scrub and stop on clothing.
6. " " make clothes-stops.
7. " " lay out bag, (see diagram).
8. Watch and ship's number.
9. Parts of ship and watches.
10. To distinguish petty-officers.
11. Where watches and parts of watch work in cleaning ships in port. At sea.
12. PARTS OF SHIP. Starboard, port, forward, aft, athwart ships, fore and aft, bow, stern, waist, on the bow, abeam, on the quarter, bulwarks, water ways, hammock nettings, keel, cut-water, stern-post, bilges.
13. SHIP'S FITTINGS. Hawse-holes, chain-pipes, bitts, compressors, capstans, hatchways, gratings, scuppers, pin-rails, fife-rails, chains, hammock-cloths, ladders.
14. MASTS AND SPARS. Lower-masts, top-masts, top-gallant and royal masts, try-sail masts, booms, gaffs, yards.
15. Shrouds, backstays, stays, pennants.
16. Square sails, fore and aft sails, head sails.
17. Bower anchors, sheet anchors, chains.
18. Boats and where they hoist.
19. Must know how to make square knot, bow-line, clove and two half hitches.
20. Regulations concerning use of tobacco.
21. " " swearing.
22. " " buying, selling clothing.
23. " " finding articles not belonging to them.
24. " " obedience, cheerfully to all orders of superiors, either officers, or petty-officers.
25. Where is galley? Orlops? Yeoman's store room? holds? sail rooms? bag rooms.
26. Where and to whom to go when you have a complaint or report to make.
27. How hours are sounded on board ship.
28. Who and where is officer of deck.
29. How to address officers.
30. What is the signal of fire and what to do.
31. The parts of a gun and carriage.
32. Implements of gun.
33. Bugle aud drum calls.

FORM NO. 5.

EXAMINATION OF APPLICANTS FOR ENLISTMENT.

I. MISCELLANEOUS.

Name? Age?
Parents, or Step-parents? Freely?
Born where? Living where?
Previous occupation? Trade preference?

[The examiner will here explain, clearly, to the applicant that he can never be an officer; that he cannot leave if dissatisfied, or if tempted by an outside occupation; that he must stay till he is twenty-one.]

II. MORALS.

Arrested ever? Reformatory school?
Intoxicating Liquors? Profanity?
Tobacco? Will he disuse tobacco?
Church attendance? Membership? Sunday school.

III. APTITUDE.

Swim? Row a boat? Sail a boat?
Ever at sea? Motive for enlisting?

IV. EDUCATION.

How long in school? When did you leave?
What studies pursued? How far in Arithmetic?
Sing? Play an Instrument?
Reading? Writing? Arithmetic?

SUMMARY.

General Intelligence.
Aptitude.
Morals.
Education.
Face, Bearing, Etc.,
Result of Examination. Recommendation?

.... *Examining*
.... *Board.*
....

U. S. T. S. MINNESOTA.

....

FORM NO. 6.

ROUTINE OF INSTRUCTION.

The Numbers refer to Crews.

	9-30 to 10-30 A. M.	10-30 to 11-45 A. M.	1-00 to 2-00 P. M.	2-00 to 3-00 P. M.
Monday.	GREAT GUNS. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. HOWITZER. 13. 14. 15. 16.	GUNNERY. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.	GUNNERY. 1. 3. 5. 13. or 2. 4. 6. 14. STUDIES. 7. 9. 11. 15. or 8. 10. 12. 16.	GUNNERY. 7. 9. 11. 15. or 8. 10. 12. 16. STUDIES. 1. 3. 5. 13. or 2. 4. 6. 14.
Tuesday.	SEAMANSHIP. 1. 3. 5. 13. or 2. 4. 6. 14. STUDIES. 7. 9. 11. 15. or 8. 10. 12. 16.	SEAMANSHIP. 7. 9. 11. 15. or 8. 10. 12. 16. STUDIES. 1. 3. 5. 13. or 2. 4. 6. 14.	SEAMANSHIP. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.	SEAMANSHIP. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.
Wednesday.	INFANTRY. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. HOWITZER. 13. 14. 15. 16.		BAG INSPECTION. Senior Class on leave according to watches.	
Thursday.	GUNNERY. 1. 3. 5. 13. or 2. 4. 6. 15. STUDIES. 7. 9. 11. 15. or 8. 10. 12. 16.	GUNNERY. 7. 9. 11. 15. or 8. 10. 12. 16. STUDIES. 1. 3. 5. 13. or 2. 4. 6. 14.	GUNNERY. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.	GUNNERY. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.
Friday.	SEAMANSHIP. 1. 3. 5. 13. or 2. 4. 6. 14. STUDIES. 7. 9. 11. 15. or 8. 10. 12. 16.	SEAMANSHIP. 7. 9. 11. 15. or 8. 10. 12. 16. STUDIES. 1. 3. 5. 13. or 2. 4. 6. 14.	SEAMANSHIP. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.	SEAMANSHIP. 1. 3. 5. 7. 9. 11. 13. or 15. 2. 4. 6. 8. 10. 12. 14. 16.
Saturday.	CLEAN SHIP.	BAG INSPECTION.	LIBERTY By Watches.	

NAVAL INSTITUTE PRIZE ESSAY, 1881.

A Prize of one hundred dollars and a gold medal of the value of fifty dollars is offered by the Naval Institute for the best essay presented subject to the following rules:—

1. Competition for the prize is open to all members, and to all persons entitled to become members upon payment of dues; that is, to all officers of the Navy and Marine Corps, and to all civil officers attached to the Naval service.

2. Each competitor to send his essay in a sealed envelope to the Secretary on or before January 1, 1881. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary, with the motto on the outside and the writer's name and motto inside. This envelope is not to be opened until after the decision of the Judges.

3. The Judges to be three gentlemen of eminent professional attainments, to be selected by the Executive Committee.

4. The successful essay to be published in the Proceedings of the Institute, and the essays of other competitors to be published also, at the discretion of the Executive Committee, with the consent of the writers.

5. The subject for the Prize Essay is, "The Type of (I) Armored Vessel, (II) Cruiser, Best Suited to the Present Needs of the United States."

6. The Essay is limited to forty-eight printed pages of the "Proceedings of the Institute."

7. The money value of the medal may be given to the successful competitor if he so elect, and he will be made a life member of the Institute.

C. BELKNAP,
Lieut. and Secretary.

Annapolis, Md., May 1, 1880.

From the Original Painting by Ary Scheffer.

No. 12. 1880. Vol. VI.

PROCEEDINGS

OF THE

UNITED STATES

NAVAL INSTITUTE.

THE AUTOBIOGRAPHY OF

COMMODORE CHARLES MORRIS, U. S. N.

PUBLISHED BY THE INSTITUTE,

ANNAPOLIS, MD.

1880.

press of
Claremont Manufacturing Company.

PREFACE.

Charles Morris was born July 26, 1784, at Woodstock, Connecticut, where his family had long resided. The first of his ancestors who settled in America was Richard Morris, who came from Wales to Boston in 1630. He had previously been in military service, and after serving as "ancient," and later as lieutenant, to Underhill, he succeeded to the command of the fort built for the defense of Boston. He also appears to have taken a part in the religious disputes of the day, and for his advocacy of Mrs. Hutchinson's tenets, he was banished to Exeter, with others, for a short time. Having made his peace with the authorities, he was recalled, and resided in Boston and Roxbury. His son Edward married in the latter place, and settled himself on a farm in what is now the town of Thompson, on the confines of Woodstock, in Connecticut. His descendants spread themselves in the neighboring towns of Worcester County, as cultivators of the soil. Charles Morris, the sixth in descent from Richard, was born in 1762, and in 1783 married Miriam Nichols. Their son Charles, born the next year, was the future commodore.

Young Morris passed the first fifteen years of his life in Connecticut and Vermont. He was taught the rudiments of knowledge by his father; but he had little or no regular teaching after he was ten years old, and his time for the next five years was chiefly spent in working on a farm. His leisure time was passed in reading every thing he could lay hands on, and the strong inclination which showed itself thus early continued through life. He entered the Navy in 1799 as an acting midshipman, at the suggestion of his father, who held an appointment as purser. He received his warrant the next year, and from that time till his death he was actively employed almost without intermission. Entering the Navy at the most trying period of its history, when it had little support or encouragement from the government, and was almost unknown to the country at large, and when its internal organization was loose and imperfect, he lived to see it in the height of its prosperity, long after it had won its way to public esteem and honor. A large share in the active work of promoting the growth

and well-being of the service during this period belonged to Morris. For more than fifty years, all his time, and thoughts, and energies were devoted to this object; and such was the esteem in which he was held by his contemporaries, that he was, during most of the time, in positions where his influence could make itself strongly felt. Like most of the men of talent in the service at that time, his early promotion was rapid. He became a lieutenant at twenty-three and a captain at twenty-eight; and before he was thirty he had been well-seasoned in two hard fought naval wars. In the war with Tripoli it was his good fortune to belong to Preble's squadron; and he thus got his early training in the same school with Hull, Decatur, Stewart and Mc Donough. The outbreak of the war of 1812 found him the executive officer of the Constitution, and his name comes down to us with that of Hull, sharing the honors of the first great victory of the war, the capture of the Guerrière. His subsequent career, though less eventful than the first few years, was marked by the same zeal, the same activity, the same earnest desire to do his best in every station that he filled. As a member of the Board of Navy Commissioners, he had, for more than twelve years, a voice upon every important question of naval administration; and, while the natural balance of his mind kept him from going to extremes, his early advancement to positions of influence and command had freed him from the excessive conservatism and unwillingness to take responsibility that are so often found in men who have spent their best energies in subordinate stations. His last sea-service was from 1841 to 1844, when he commanded a squadron, first in Brazil and later in the Mediterranean. On his return he was appointed Chief of the Bureau of Construction. From 1847 to 1851 he was on special ordnance duty, and, in 1851, he became Chief of the Bureau of Ordnance and Hydrography. He died Jan. 27, 1856, at the age of seventy-two, at Washington, continuing the labors of his office till within a few days of his death. During his naval career of fifty-seven years, he had been twenty-one years at sea, and less than three years off duty.

We are fortunate in having the record of the best part of Morris's career from his own hand. The autobiography, which appears for the first time in these pages, was prepared by him, not with any view of publication, but simply to tell his children the story of his life. It is to their kindness that the Naval Institute is indebted for the possession of the manuscript and the permission to make it public. A few passages, relating to purely personal and domestic matters, have been

omitted, and a few have been added to explain or supplement the narrative, none of the foot-notes forming part of the original manuscript. As a sketch of the development of the Navy from 1800 to 1840, when the narrative closes, and as the testimony of a prominent actor in some of the leading events in which the Navy has taken part, its value to the service is apparent at a glance. As the biography of one who was thought by many of those who knew him the foremost man of the old Navy, one who united judgment and self-control, in the highest degree, with courage and zeal, and who was as successful in the office as upon the quarter-deck,—and as the modest record of a blameless life,—it may not be without its lessons for the Navy of to-day.

J. R. S.

U. S. Naval Academy,
June, 1880.

THE AUTOBIOGRAPHY OF

COMMODORE CHARLES MORRIS, U. S. N.

About May, 1799, a letter was received from my father informing us that he held an appointment as purser in the Navy, and that he could obtain an appointment for me as acting midshipman, if I would join him soon at Norfolk, Virginia, which he strongly recommended. This proposition was, of course, the subject of consultation with our friends. Its importance was so little understood, and the Navy then so little known and appreciated in that part of the country, that our friends were unanimous in their advice that I should remain, rather than expose myself to the moral dangers and profitless hardships which they supposed were the necessary attendants on a sea life. Fortunately my mother judged more wisely, and had the fortitude to recommend my acceptance of the offer, though it separated us from each other. For myself, entirely ignorant of everything connected with the Navy, I was ready to comply with the wishes of my parents, and probably with vague hopes of some future but unknown advantages. Little time was necessary to complete the few preparations that we could make, and, on the 1st of June, I took leave of my affectionate and excellent mother, and, with my small bundle on my shoulder, turned my back on friends and acquaintances to seek my fortune in the world, much in the style and condition of some of the heroes of nursery tales. Two days' walk carried me to Providence, where I was kindly received by my father's uncle, William Wilkinson, and remained till a passage offered for Norfolk, in a coasting sloop. We had a rough passage of fourteen days, during eight of which I experienced all the distressing and depressing effects of sea-sickness. When this had passed I derived much encouragement and considerable information respecting naval duties from the master of the sloop. He had been impressed, and had served some years in the British Navy, and was able and willing to give me useful information relative to the occupation, duties, and prospects of midshipmen, and in that way to prepare me, in some small degree, to enter upon the duties.

On my arrival at Norfolk I had the good fortune to find the U. S. ship Baltimore, to which my father was attached, lying in the harbor. He soon introduced me to the captain of the ship, Samuel Barron, from whom I received an order to act as midshipman from the 1st of July, 1799, and immediately entered upon the duties which connected me with a profession in which I have since passed my life. The Baltimore was dismantled very soon after I joined her, and the officers mostly dispersed. My father repaired to Washington to settle his accounts, and I lived on shore to attend a school, with a view of gaining some knowledge of the theory of navigation, as it was then explained by Mr. Hamilton Moore. My instructor was both ignorant and indolent, and my time was consequently spent to very little advantage for the few weeks I was with him.

Early in September my father was ordered to the frigate Congress, recently launched at Portsmouth, N. H., and directed me to join him there with his baggage. As my connection with the Baltimore had ceased when she was paid off, no permission was necessary from others to leave Norfolk, which I did soon after in a coasting schooner bound for Warren, Rhode Island. Thence I proceeded by land to Portsmouth, a journey, at that time, of three days, by the mail stage. At this place I rejoined my father, who lodged in the same house with the captain of the Congress, James Sever. From him I received another order to act as midshipman in the Congress. The ship was not in a situation to require the attention of the officers for some weeks, during which time I was employed by the captain, in the absence of a clerk, to copy out all the requisitions for the ship's equipment and stores. By this employment I at least learned the names of articles used in a ship of war, which was of some service to me afterwards. The equipment of the ship was so far advanced that she could be removed to Boston in November, where everything was completed before the middle of December. The captain had selected me for one of his aides, the other being Henry Wadsworth, who was afterwards blown up in the Intrepid, with Somers, in the harbor of Tripoli. It was our duty alternately to go to Boston from President's roads daily, in the morning, for the captain, and to take him back again in the evening—a duty of some severity, when we had to contend against a keen December NW. wind and an ebb tide, but one for which my former life had prepared me.

Late in December we went round to Newport, where we met the Essex frigate, commanded by Captain Edward Preble, and a number of merchant ships that the two frigates were to convoy to, or towards,

India and China. The complement of officers was now completed, and comprised a captain, three commissioned lieutenants, one acting lieutenant, a master, surgeon, purser and marine officer, in the ward-room, a surgeon's mate, eight midshipmen and a clerk, in the cockpit and steerage. Captain Sever had held a subaltern's commission in the army for a year or two before the close of the war of the Revolution, where he had acquired some knowledge of military discipline. He had afterwards made several voyages to Europe, in most of them as master of vessels belonging to his relatives. He had also made one or two cruises in the sloop Herald before he was appointed to the Congress. He was well-educated, very austere and distant in his manner, not very amiable in temper, rigid in his discipline, and very punctilious in all matters of military etiquette. I believe he was rather deficient in seamanship, but remarkable coolness and self-possession in trying situations enabled him to decide and direct what was proper to be done better than most of his officers who better understood their profession practically. All of our commissioned lieutenants had commanded merchant ships to India or the NW. coast of America. They were good seamen, but, with one exception, had few qualifications as officers. The master had passed many years in the British Navy, and some of them as a master. He had all the defects of the lieutenants united to a greater want of general knowledge and an entire loss of all presence of mind when assailed by any sudden danger. The marine officer and surgeon were well informed, and of good manners. All the midshipmen were older than myself,—several of them over twenty years of age,—and some of them already accustomed to a sea life in the merchant service. They were all warranted, also, except myself. Four of them had been prepared sufficiently to enable them to commence a collegiate course of study, and all had been much better educated than myself.

I had the pleasure of again meeting my mother at Newport, where she passed a fortnight, and I had permission to remain on shore during her stay. Her advice, united to her strong hold on my affections to give it weight, had a powerful and beneficial influence on my conduct, at that period of my life, when I was about to be exposed to strong temptations, of which I had no previous knowledge, and to which if I had yielded they would have plunged me into early ruin. It had the effect, also, of rousing some ambition to endeavor to prove myself worthy of her regard and affection, by my conduct as an officer, as well as in other relations.

The arrangements of our little squadron were completed in time for us to leave Newport on the 6th of January, 1800, with strong but favorable winds which carried us rapidly to the eastward. By the 10th the wind had shifted to the southward, and on the 11th had increased to a heavy gale; and early in the evening we lost sight of the other vessels, which had been already much separated. In the hope that the Essex might close, the Congress lay to for the night, making frequent signals, but it was afterwards learned that the Essex bore up early before the gale.* The rigging of the Congress had been necessarily fitted in cold weather, and, being new, the great change of temperature and the strain brought upon it by the gale stretched it so much during the night that after the deadeyes of the lower rigging had been brought together, it was necessary to prop the rigging to give it any regular tension. The masts were made from single sticks of white pine, and, notwithstanding all exertions to support and relieve them, the mainmast was found to be badly sprung near the deck, shortly after daylight. Having the morning watch I had been early on deck, but my total ignorance of everything connected with the sea left me entirely free from any apprehension. In fact, though the gale was then quite as severe and the sea as high and threatening as I have seen them since, I supposed it to be nothing unusual, because the waves were not literally "mountains high," as described in the tempests of which I had read. As the morning advanced, however, the danger of the masts, the lowering down of the main yard, the presence on deck of the captain and all the sea officers, and their apparent anxiety and frequent consultations, began to have their effect on my own mind and to induce a belief that there was more than usual danger. I had little time, however, for such reflections, as the mainmast was carried away about 8 A.M., carrying with it the head of the mizzenmast. I became entangled in the maintopgallant brace and was carried up by it nearly as high as the mizzentop, and when disengaged fell upon deck, striking upon my head. I was taken up, stunned and insensible, with my right arm broken near the shoulder, and otherwise much bruised. The foremast and bowsprit of the ship were lost about 4 P.M., when she was left to the mercy of the gale for some hours, until arrangements were made that enabled a small sail to be set, under which she was put before the gale until it moderated.

* The Essex continued on her cruise, and was thus the first American ship-of-war that doubled the Cape of Good Hope.

The concussion of the brain that resulted from my fall left me insensible for several days, during which but little hopes were entertained of my recovery; but consciousness was at last restored, and when the ship reached Hampton roads, at the close of February, I had so far regained my strength as to be able to come on deck.

Our naval establishments were then without supplies, or any of the conveniences for equipping or refitting ships, and the Congress was necessarily detained until new masts, rigging and sails could be made and fitted. As there was not much active duty for the officers, I was allowed to remain on shore till my health was re-established, which required six or eight weeks.

The loss of the ship's masts, representations from one of the lieutenants, and newspaper reports of unseamanlike conduct in Capt. Sever during the gale, induced that officer to request a court of inquiry on the subject. This court exonerated him from all blame. The masts had been made from single sticks of white pine and were found to have been quite defective at the heart; and all proper exertions were proved to have been made for securing them which the state of the weather would allow. The statements of the lieutenant were not sustained by the testimony of others, nor fully by his own, when under the obligations of an oath. So far as I can recollect the force of the gale, and after comparing it with those I have seen since, I am disposed to concur in the opinion of the court. The severity of Capt. Sever's discipline, as it was then considered, had rendered him very obnoxious to many of the officers, who were impatient under restraint or control, and these, through their friends and others, had been able to excite a very general and strong prejudice against him, which was not diminished by his austere and reserved manner in his intercourse with those into whose society he was thrown.

By the time I resumed my duties on board, many changes had taken place among the officers. All the lieutenants were new. All had commanded merchant vessels, and, as with their predecessors, were unwilling to give that ready and full obedience to orders which the captain required, and which was due from them. Several of the midshipmen also left the ship and some of them then left the service. These were replaced by others, and an additional number ordered. I had been fortunate enough to please Captain Sever, and on one or two occasions to receive special approbation. This, and probably the injury I had received in the late gale, procured for me his recommendation to the Department for a warrant, which bore date May, 1800,

and was delivered to me soon after by Captain Sever, as part of the dessert of a dinner to which he had invited me.

My previous appointment had no stable foundation and depended entirely on the pleasure of the captain. It only made me the companion, but not the official equal, of other midshipmen, and gave no claims for further advancement. By my warrant the whole path of professional promotion was laid open before me, and it now depended mainly upon my own exertions to advance upon it. I felt truly grateful to Captain Sever for this great favor, received through his intervention, and it kindled my ambition to prove myself worthy of it by a close and cheerful attention to my duties. My relative standing had been changed by other causes. Among the midshipmen who had recently joined the ship, there were several who were as little acquainted with mathematical subjects as myself, and with less disposition to supply their deficiency. They were fond of gross pleasures, and had means beyond their pay by which they could gratify them; and they found in their duties little that was agreeable and much that was irksome and repulsive. It was not very difficult to occupy a position which should appear to advantage when contrasted with them. By hard study and the aid of a petty officer I was able, before the ship sailed, to master the elementary studies embraced in Moore's Navigation, so far as to find the ship's place by dead reckoning, and to keep an ordinary journal. Strange as it may appear at this day, these small acquirements placed me on a level with the greater portion of the lieutenants at that time.

So short a time had then elapsed since the commencement of our Navy, that almost all the commissioned officers had been appointed from the merchant service. Chronometers were unknown in the Navy; sextants were very rare, and their use still more so. The navigators who could ascertain the longitude by lunar observations were few in number, and the process of the calculations a mystery beyond ordinary attainments. It may be easily conceived that in such a school, even under the most favorable circumstances, little theoretical knowledge could be acquired by the midshipmen when embarked. That any should have been sought could hardly be expected, where no aid was given, and where the want of that knowledge was considered as no cause for reproach.

The Congress was made ready for another cruise, and left Hampton roads July 26, 1800, for Cape François,* in San Domingo, for the

* Now commonly known as Cape Haïtien.

purpose of protecting our commerce with that port, which was then valuable.* The monotony of this service was only broken by two visits to the harbor of the Cape, and two to that of Cape Nicolas Mole, with a short cruise as far to windward as San Juan, in Porto Rico. On our return to the latter place, a circumstance left a strong impression on my mind as indicative of the presence of mind of Captain Sever and our gunner. The French privateers, which were then rather numerous in some parts of the Carribean sea, had not visited our station to enliven us by a chase. We, however, fell in with one as we were running down from Porto Rico, which, on being pursued, led us, intentionally or otherwise, directly towards a shoal known as the Silver Keys. In the eagerness of pursuit the danger of our course was probably forgotten, the attention of all being engrossed by the chase, in which we were gaining upon the privateer. While I was watching her movements with others on the forecastle, the gunner, who was at my side, quietly told me to look at the water under and near our bows. My attention being thus directed, rocks were visible, which, to appearance, were very near the surface. The gunner then told me to go quietly to the captain, who was on the quarter-deck, and tell him what I had seen, but not to mention it to others. This was quickly done. Captain Sever told me to remain by him, and turning to the officer of the deck directed him to "ready about," and, as soon as ready, to tack; and when about, to keep her off two points, by which to gain her former track. Then for the first time the captain looked over the side of the ship, and the officers and crew knew the danger in which we had been placed. This course prevented all danger from confusion, either in the mind of the directing officer, or in the labors of the crew. The privateer being of very light draft of water was able to continue her course and escaped.

Another time, when we were collecting a convoy of merchant vessels with which to proceed to the United States, the ship had been lying to during the night, and from some cause had very unexpectedly got so near the Caicos reefs, that at early daylight the cry of "Breakers, close ahead!" was given by the lookouts. The deck was in charge of the master, who was a skillful seaman, but whose presence of mind was so entirely destroyed by the imminence and suddenness of the danger that he could do nothing towards extricating the ship from it.

* The hostilities between the United States and France which broke out in May, 1797, were not brought to a final close until February, 1801.

I was on deck at the time and felt justified, under the circumstances, in calling the captain without orders from the officer of the deck. Waking from sound sleep, he came immediately on deck, took the trumpet from the bewildered master, and wore the ship, but so near to the breakers that a stone might have been cast into them from the ship.

Another evidence of the great advantage of coolness and self-possession was given by Captain Sever before our cruise was closed. When approaching our coast we met with a very furious gale blowing from east to south-east, which brought us to a close-reefed maintop-sail. In the middle watch the gale shifted, almost in an instant, to the north-west, and taking the ship aback, gave her such a sternboard as drove the sea through the cabin windows, with force enough to carry away a part of the cabin bulkhead. The master was again in charge of the deck, and again helpless and useless. The captain, who had been roused by the shock, was immediately on deck; and taking the trumpet, he restored order and soon extricated the ship from her dangerous situation.

As France was at this time the common enemy of the United States and England, signals had been arranged by the commanding officers of the respective squadrons, by which their national vessels could be recognized, and thus prevent unnecessary chasing, or hostile collision through mistake. These signals were generally interchanged, when necessary, in courtesy and good feeling. On one occasion, however, during this cruise, we met with a frigate of our own force, whose commander chose to exhibit something of the arrogance which was at that time and for some years afterwards but too common with English naval officers. When the English frigate was discovered, the usual private signal was shown by the Congress, but no answer was returned. It was kept flying while the ships approached, until they were so near to each other that it could not be misunderstood, but the frigate made no reply. When we were quite near, she shortened sail, and it could be seen that the tompions were out of her guns. Our crew were, as a matter of course, brought to quarters, and when at a proper distance we shortened sail. The Englishman appeared to have been waiting for this to make all sail again by the wind, which we also did, as fast as it could be done with our men at quarters; and then the other again shortened sail, and hove to. We again followed his motions, and ranging within hail, the names of the respective ships were exchanged. He then filled and stood on. Our ship was soon put under the same sail, and we followed nearly in his wake. It was soon evident that

we outsailed the other, and after a short time the English ship tacked; we passed to leeward beyond his wake and tacked also. In about half an hour we came up on his weather quarter, and passed along to windward of him, within hail, both ships at quarters, until we had passed a little ahead of him, when our ship bore up and passed across his bows, almost touching his flying jib-boom, and went on her way. The conduct of Captain Sever on this occasion gave pleasure to all of us. The object of the English captain was evidently to annoy and trifle with us, if not to insult us, and the movements of our ship with reference to his were as much like treading on toes as circumstances would permit.

For the greater part of this cruise I was stationed in the maintop, with Henry Wadsworth, from the other watch, as my associate. The duties which were then required of midshipmen were calculated to make them sooner and better acquainted with the details of a seaman's duty than the more relaxed system of later days.* Besides being obliged to take an active personal share in the ordinary duties, they were frequently exercised collectively in managing the sails and yards of the mizzenmast. By this training I learned something of practical duties, and by application, when leisure offered, I was able to keep up an ordinary journal, construct a chart, and mark upon it the ship's track.

The ship returned to Boston in March, 1801. Peace having been restored between the United States and France, the ships were recalled home, and preparations commenced for discharging their crews, placing them in ordinary, and reducing the officers to the numbers which had been designated for a peace establishment. While the ship was waiting for orders, leave was granted to me for an absence of a fortnight, of which I availed myself to visit my mother. I was recalled at the end of a week, as the ship had been ordered to Washington and would sail soon.

The ship was delayed by head-winds so that we did not reach Washington till late in May. We passed the frigate United States in the lower part of the Potomac. About 10 o'clock in the morning of a beautifully serene day, we passed Mount Vernon. Every one was on deck to look upon the dwelling where Washington had made his home. Mrs. Washington and others of the family could be distinguished in the portico which fronts the river. When opposite to the

* It must be remembered that this was written about 1840.

house, by order of Captain Sever, the sails were lowered, the colors displayed half-masted, and a mourning salute of thirteen guns was fired as a mark of respect to the memory of Washington, whose life had so recently been closed, and whose tomb was in our view. The general silence on board the ship and around us, except when broken by the cannon's sound, the echo and re-echo of that sound from the near and distant hills, as it died away in the distance, the whole ship's company uncovered and motionless, and the associations connected with the ceremony, seemed to make a deep impression upon all, as they certainly did upon me. When the salute was finished the sails were again set, the colors hoisted, and we proceeded up the river. The frigate New York had preceded us, without saluting, but we found her grounded on the bar at the entrance of the eastern branch of the Potomac, and the Congress, passing her, was the first ship of war that reached what has since become the Navy yard at Washington. The frigates New York and United States joined us a few days afterwards.

After a visit to the ships by President Jefferson and the members of his cabinet, the crews were paid off and the ships dismantled. There was only one house at that time standing in the quarter of the city near the Navy yard. Tents were pitched and shanties erected among the bushes which covered the slope of the hill, by persons from Baltimore who came to supply the wants of the sailors. The "Six" and the "Seven" buildings, the shell of what was intended for a hotel, where the General Post-Office now stands, a low tavern on Pennsylvania Avenue, the President's House and its yard, enclosed with a rail fence, and the south wing of the Capitol, surrounded by building-rubbish, were then the principal if not the only buildings in the city of Washington.

The arrangements for the ships were completed early in June, and on the 4th those officers who had been selected to be retained in service, from the officers belonging to the ships present, were notified of their retention, and furloughed or ordered on other duty. My own orders directed me to join the frigate Constitution, in Boston, after the expiration of a furlough of three months. In the reduction of the officers as required by the law, thirteen captains were selected (of whom five had been promoted) from twenty-eight then in the service, seven masters commandant were discharged, thirty-six lieutenants were retained from one hundred and ten, of whom seventeen had been promoted from midshipmen, and one hundred and fifty-nine midshipmen from three hundred and fifty-five. So great a reduction

undoubtedly deprived the service of some valuable officers, but relieved it of many who were never worthy of belonging to it. Political preferences probably had some influence in the selection of the captains, but the selection generally was admitted to be quite as judiciously made as could have been expected.

The necessity which existed at the commencement of the Navy of drawing the commanders and lieutenants entirely from the merchant service, introduced many who had few or none of the higher qualifications proper for their new situations. For the commanding officers, some of those who had been employed in the Naval service during the War of the Revolution were still available and were secured, and these were generally of higher character than the other commanders or the lieutenants. Of these latter a very large proportion were not only men of no refinement, but vulgarly profane and grossly intemperate. Very many of the midshipmen had attained an age at which their habits of thought and action had become too firmly established to be easily changed, and gave little promise of any future usefulness. A majority of those with whom I had been associated were of this character, and of the others several preferred to leave the service rather than continue in it with the few inducements which it then offered. Captain Sever, who was violent in politics, was among those who were dropped. Only one of the eight lieutenants, and three of all the midshipmen, who had been attached to the ship, were selected, of whom the lieutenant and one of the midshipmen resigned the next year.

My father was retained till the following November, during which time he was employed in settling his accounts with the officers of the Treasury. Hitherto I had received the benefit of his supervision since I had joined the Navy. I was now to be separated from him and left to my own guidance. With a tolerable wardrobe and one hundred and fifty dollars, I was given to understand that I must thenceforward depend on my pay for support, unless misfortunes not occasioned by my own misconduct should render further assistance necessary. The full pay of a midshipman was then about two hundred and thirty dollars a year, and the furlough pay half that amount. Under the most favorable circumstances, rigid economy and abstinence from all pleasures which depended on expense were indispensable; and when on furlough, as I then was, the difficulties of preserving a decent appearance were of course greatly increased. Freedom from debt and the feeling of pecuniary independence consequent on such freedom, was a very

early and a very strong desire with me, and has continued through life; and it has always been difficult for me to imagine a sufficient motive for any one to sacrifice that independence for any personal gratification not indispensable for health. This feeling naturally deprived me of many amusements in which my associates frequently indulged. I do not think, however, that my non-participation operated to my injury, even in their opinions, whilst in a manner it compelled me to seek other amusements attended with little or no expense. These I found in reading, for which I had retained my fondness, or when opportunity offered, in the society of families with whom I had formed an acquaintance, and thus slightly increased my too small store of knowledge, and acquired a little familiarity with the usages of society. Subsequent observation tended to confirm me in these courses. It was sufficiently apparent that those who wasted their time and money in the grosser gratifications of sense, or the idle display of vanity, neither acquired the confidence of their superiors, nor the respect of the generality of their acquaintances. Those, on the contrary, who sought to improve their minds, and to increase their professional and general knowledge; who showed a preference for respectable and intelligent, and especially for domestic society,—hardly failed to inspire esteem, and to gain an interest with the worthy, which was not only a source of great present gratification, but at the same time strengthened all their better feelings and principles, and gave new and strong securities for their future good conduct. When I recur to the sad fate of many young men whom I have known to enter the Navy with bright hopes, fine talents, and without any marked vices, but who have been insensibly and gradually led by the example and persuasions of others into habits of expense, idle amusements, sensual indulgence, and eventual intemperance, to public disgrace and a miserable death, I cannot feel sufficieutly grateful to that kind Providence which preserved me through the temptations of youth.

In my journey from Washington to Providence some of my late messmates were companions, and with them a few days were given to visiting objects of interest in Baltimore, Philadelphia, and New York. The steam machinery for raising water for the city of Philadelphia was at the junction of the present Broad and Market streets, and was not a short ride from the settled part of the city. The City Hall in New York, not then finished, was quite in the upper part of the city, and there were many small houses of wood in Broadway between the Battery and Trinity Church.

Although anxious to revisit my mother I remained in Providence six weeks, during which, under the instruction of Professor Wirt, I renewed my previous studies in Moore's Navigation, and mastered the mystery of ascertaining the longitude by lunar observations, according to the rules contained in that treatise. Of the principles on which the calculations were founded I still remained perfectly ignorant, and had no proper appreciation of their importance. Instead, therefore, of pursuing my studies further, I considered myself entitled to no small credit for having delayed my visit to my mother so long, and hastened to pass a few happy weeks with her and the rest of the children. These soon passed, and I joined the Constitution at Boston, then under command of Commodore Talbot, conformably to my orders. The ship was stripped, and had been opened for examination and repair. The wardroom officers resided on shore, and Commodore Talbot soon resigned, and the midshipmen lived on board without the supervision of superior officers, and without regular occupation. Fortunately my uncle, Noadiah Morris, who had been the secretary of Commodore Talbot, was near me, and procured me another furlough, which allowed me to return to my home.

During my absence from home, my father, having left the Navy, had returned and purchased a house in the village of Woodstock, Connecticut. A building for an academy had been commenced, and was completed during the winter, and a school was opened under the direction of a good instructor. I joined this school early in the spring of 1802, and remained in it about nine months. My father, however, decided to dispose of his purchase and remove to a small farm, near a brother of his in Montgomery County, New York. This removal took place in October, 1802, and I accompanied the family thither.

In the spring of 1803 I proceeded to Woodstock, with the intention of resuming my studies until called into service. For the moment, I engaged in study again at the academy. This was very unexpectedly interrupted, about the middle of May, by an order from Commodore Preble to join the Constitution at Boston without delay. By the 20th of May I reported to the Commodore for duty.*

* Preble had just before been appointed to command the squadron fitting out against Tripoli. The Tripolitan war, which had been begun by the action of the Pasha of Tripoli in May, 1801, had been prosecuted thus far by the United States with little success. Two squadrons had been sent out, the first under Dale, and the second under R. V. Morris, without making any serious impression on the enemy. The third squadron was commanded by Preble, and sailed in 1803. It

The commodore had been recently appointed to the command, the ship was preparing to be hove out and coppered, the crew had not been collected; and only two or three of the officers had joined. For those who were present there was consequently full and laborious employment; which was fortunate for me, as it had the effect of relieving, in some degree, the deep depression of spirits from which I had suffered much whilst my future prospects had been so entirely uncertain. Though improved, still these prospects were not of a very cheering character. I seemed to myself peculiarly isolated, unknown to the commodore or any of the officers, and without any influential friends to aid my own exertions. The uncle who had formerly been with Commodore Talbot was, however, soon selected by Commodore Preble as his secretary, with the nominal appointment of chaplain, as was then usual. I had then the benefit of his society and counsel, which, with active duty and the consciousness, which was soon attained, that I could fairly compete with the other midshipmen in all professional duties, and with most of them in general information, restored my cheerfulness, and brighter hopes for the future were indulged.

A very violent and easily excited temper was one of the prominent characteristics of Commodore Preble, from the undue expression of which, when he was greatly excited, no officer could escape. Irresolution, no less than contradiction, was an offence in his eyes, and decision of action as well as obedience of orders was necessary to preserve his favorable opinion. The ship was refitted at a wharf in Boston, while many of her former stores were in the Navy yard at Charlestown. The commodore one day directed me to repair to the Navy yard daily and send to the ship such articles as should be required from time to time. As only a small part of the crew had then been collected, I inquired how many should be taken for the service; to which I received the reply, in no mild tone, "None; get your men where you can find them." I thought best to take him at his word, and engaged ten or twelve men; and when the work was completed presented to the commodore for approval an account for their wages. This produced another outbreak, with the inquiry as to how I had dared to incur such an expense without his orders; but on being re-

was composed of the Constitution, flagship, Commodore Preble; Philadelphia, Captain Bainbridge; the brigs Argus, Lieutenant Decatur, and Siren, Lieutenant Stewart; and the schooners Nautilus, Lieutenant Somers, and Vixen, Lieutenant Smith. The schooner Enterprise, Lieutenant Hull, of Morris's squadron, remained with Preble, Hull and Decatur exchanging commands.

minded of his former conversation he gave his signature and dismissed me with courtesy.

The equipments of the ship were completed in time to leave Boston on the 14th of August, having on board as passengers the Consul-General to Algiers, Colonel Lear, and his wife. We had nothing of interest on the passage until near the entrance of the straits of Gibraltar, when, upon a very dark evening, with very light winds, we suddenly found ourselves near a vessel which was evidently a ship of war. The crew were immediately but silently brought to quarters, after which the commodore gave the usual hail, "What ship is that?" The same question was returned; in reply to which the name of our ship was given, and the question repeated. Again the question was returned instead of an answer, and again our ship's name given and the question repeated, without other reply than its repetition. The Commodore's patience seemed now exhausted, and, taking the trumpet, he hailed and said, "I am now going to hail you for the last time. If a proper answer is not returned, I will fire a shot into you." A prompt answer came back, "If you fire a shot, I will return a broadside." Preble then hailed, "What ship is that?" The reply was, "This is His Britannic Majesty's ship Donnegal, eighty-four guns, Sir Richard Strahan, an English Commodore. Send your boat on board." Under the excitement of the moment, Preble leaped on the hammocks, and returned for answer, "This is the United States ship Constitution, forty-four guns, Edward Preble, an American Commodore, who will be damned before he sends his boat on board of any vessel!" And, turning to the crew, he said, "Blow your matches, boys!" The conversation here ceased, and soon after a boat was heard coming from the stranger, and arrived with a lieutenant from the frigate Maidstone. The object of this officer was to apologize for the apparent rudeness which had been displayed. He stated that our ship had not been seen until we had hailed them; that it was, of course, very important to gain time to bring their men to quarters, especially as it was apparent we were not English, and they had no expectation of meeting an American ship of war there; and that this object had induced their delay and misrepresentation in giving the ship's name. These excuses were deemed satisfactory, and the ships separated.

This was the first occasion that had offered to show us what we might expect from our commander, and the spirit and decision which he displayed were hailed with pleasure by all, and at once mitigated

greatly the unfriendly feelings which the ebullitions of his temper had produced. We arrived at Gibraltar on the 12th of September, and there learned that a new enemy had arisen in the Emperor of Morocco, one of whose cruisers had captured an American vessel a few days before, but had fortunately been met by the Philadelphia, Captain Bainbridge, who had secured both vessels and brought them to Gibraltar.* A few days after our arrival, Commodore R. V. Morris came in, on his way to the United States, having been recalled for imputed neglect of his duties. Some exchanges of officers were made between the ships, and among those who joined us was my old messmate, Henry Wadsworth.

A short visit was made by the ship to Cadiz, and upon her return to Gibraltar, she was met by the New York, Commodore Rodgers,† and the John Adams, Captain Campbell. With these vessels and the schooner Nautilus Commodore Preble proceeded in the Constitution to Tangier, to coerce a renewal of our treaty with Morocco. Before the Squadron sailed, I had been detached with others to the Moorish prize, the Mirboka, where we found Midshipman Mc Donough from the Philadelphia.

While we were thus lying in the harbor a circumstance occurred which furnished an opportunity for the display of the insulting arrogance of a British captain, a quality which had become almost proverbial, in their intercourse with the vessels of other nations. Three men who had been sent from the Philadelphia to the prize managed to desert from her. Mc Donough and myself were sent into Gibraltar to search for them. They were at last discovered together not far from the mole, which sheltered the English naval establishment; but they discovered us also and immediately separated and fled. Two were soon secured by us, and we learned that the other had entered the dockyard. We requested a sentry who was near to take charge of our prisoners, to which he assented, probably mistaking us for English officers. We

* The Mirboka was captured by Bainbridge, off Cape de Gata, having in company the brig Celia of Boston, which she had seized near Malaga a few days before, in direct violation of the treaty then existing between the United States and Morocco. The Mirboka carried orders from the Governor of Tangier to capture all American merchantmen that she might meet. She was finally restored by Preble to the Emperor, on his re-affirming the treaty, and disavowing the acts of the Governor of Tangier.

† Commodore Rodgers remained in command of the Mediterranean squadron during the interval between Morris's departure and Preble's arrival.

then went into the dockyard, where we found the other deserter in a ship's boat, from whose officer he had claimed protection as a British subject. To our request for his delivery, the officer stated the necessity of his referring the decision to his commander, but at the same time he politely offered to take us on board with him, that we might obtain it. He belonged to the frigate Medusa, Captain Sir John Gore. When we arrived on board, we remained on the quarter-deck while the English lieutenant went to make his report to the captain. We were thus detained nearly half an hour, during which time no one entered into conversation with us or offered any civility. On the contrary, when Mr. Mc Donough asked for some water to allay his thirst, he was directed to the scuttle-butt by the mainmast. The captain came on deck while Mc Donough was thus absent, which left me to commence the conversation. When the claim for the man was made, on the ground of his being a deserter from our service, the captain replied that he had avowed himself to be a British subject and as such had claimed protection. It was urged in answer that if such was really the fact, he must have practised a deception on our officers, as we did not enter English subjects if we knew them to be such; and that his word ought to have as much weight in one instance as in the other, in the absence of all proof. The captain said he should retain him, and remarked that the man had stated that there were many other English in the Constitution. Feeling excited by the manner of Captain Gore, I replied that it was possibly true, but I thought not. He remarked, "We shall take steps to make you give them up," and I replied that I did not think they would. "We have done such things before as taking men from your ships of war,'' was his next remark; and I answered that they would not do it again. A formal demand was then made for the man, to which as formal a denial was given. A request was then made for a boat to land us, as we had come on board by the invitation of his officer, and this was granted. During our absence, our national character had been ascertained by the officer of the guard, and the men we had left in charge of the sentry had been released. The commander of the prize, and subsequently the commander of the Siren, repeated the demand for this deserter, but without success.

Peace having been concluded with Morocco by Commodore Preble, the prize was ordered to join him at Tangier, where she was returned to the Moors. The difficulty respecting the deserter having been reported to the commodore, I was sent for to relate the circumstances

to him. The repetition of the conversation roused all the violence of his passion, which, in the absence of the real object, fell upon me. As I could not believe myself deserving of this severe censure, I made some remarks which only served to increase his anger, and I left the cabin with the assurance of an immediate arrest. As a precautionary measure I prepared a statement of the conversation with Captain Gore, with McDonough's sanction to its correctness, as he had joined us in time to hear all but the very commencement.

No arrest was made, however, and my anxieties were relieved soon after by an assignment to a special and very responsible service, with instructions from the commodore himself. The Medusa had left Gibraltar before the commodore's return, and they did not afterwards meet, which probably prevented some serious difficulties. The other vessels of war at Gibraltar, however, were open in their arrangements for encouraging and facilitating desertions from our vessels, and to this cause it was probably owing that Syracuse was selected by the commodore as our rendezvous, in preference to Malta, where our vessels had previously resorted for supplies.

On our passage from Gibraltar toward Malta, we met a British frigate, from which we learned the loss of the frigate Philadelphia, and the capture of her officers and crew by the Tripolines. This was a severe blow. The really efficient force of the squadron for all offensive operations against the city was diminished nearly one half, and the capture of so many of our people strengthened the means of the enemy to insist on terms of peace that would be more in his favor than he could otherwise have expected. When we arrived off Malta letters were sent out to the commodore from Captain Bainbridge, which gave all the particulars of this sad disaster.* The ship proceeded to Syracuse, accompanied by the Enterprise, Lieutenant Decatur, which we had met near that place.

Arrangements were made for landing spare stores and provisions at this place, as the port of rendezvous for the squadron. Another midshipman and myself were placed in charge of these stores, and resided on shore. This employment was very agreeable, but not very advantageous. With no knowledge of the language or of the people, the

* The Philadelphia was maintaining alone the blockade of Tripoli, and on the 31st of October, while chasing a blockade-runner, she grounded on a shoal. In this situation she was attacked by a division of Tripolitan gunboats, and surrendered, being unable to offer any resistance.

pleasure as well as the improvement to be gained from social intercourse was very limited, whilst my separation from the ship diminished my opportunities for professional improvement. I endeavored to learn the language, but I was soon after recalled on board, under circumstances that again seemed to destroy my hopes of favor from the commodore. In the attendance to our shore duties, my companion and myself had agreed to take alternate days, during the absence of the squadron, which had proceeded off Tripoli. The commodore returned on a day when my companion should have been on the lookout; but he happened to neglect an early visit to the harbor, and the morning was well advanced when I accidentally discovered the arrival of the ship, and proceeded to receive orders. It so happened that the receipt of articles had been delayed in consequence of our neglect, and having first presented myself, the commodore neither asked nor waited for any excuses, but publicly ordered me to rejoin the ship immediately, as a punishment for my negligence. As my companion escaped all censure and was continued in his duties, I thought myself treated with injustice, and my feelings strongly prompted me to ask permission to leave the squadron; and if it could not be otherwise obtained, to leave the service. The better judgment of my uncle and his persuasions induced me, however, to continue, and to hope for more favorable consideration; and I resumed my ordinary duties. Subsequent events proved the wisdom of this decision, and showed that the circumstances which, at the time, seemed most adverse to my interest were to contribute most essentially to my advantage.

The arrangements for the destruction of the Philadelphia in the harbor of Tripoli, were soon after determined upon and the officers selected for the enterprise. It was my fortune to be among the number, which probably would not have been the case had I remained on shore duties. The general arrangements and success of this expedition have become matters of naval history, but, as it was among the earliest of the operations in the Mediterranean which gave reputation to the Navy, and was the means of introducing me to the favorable notice of my brother officers, a statement from me may have sufficient interest to justify the repetition.

A ketch which had been recently captured from the enemy, when on her way to Constantinople with a present of slaves and other articles for the Grand Vizier, was fitted to receive the persons who were specially selected for the enterprise. She was about sixty tons burden and was manned by sixty-four persons, of whom Lieutenant

Stephen Decatur had the command.* The brig Siren, Lieutenant Stewart, was to accompany us, to assist with her boats and to receive the crew of the ketch (which had been named the Intrepid), in case of her destruction, which was considered probable. The officers were told to take only a single change of linen, and no time was allowed to prepare stores, as we embarked within an hour after receiving notice, and sailed immediately, on the evening of the 3rd of February, 1804. Combustibles had been previously prepared and placed in the vessel, with ship's provisions for two or three weeks' supply. A Maltese had also been obtained to accompany us as a pilot into the harbor, with which he was well acquainted. We arrived in sight of Tripoli about the 10th, but the wind was fresh from the westward, with strong indications of an approaching gale. After some consultation between the commanders, the vessels anchored under cover of the night near the entrance, and a boat was sent with the pilot to determine by observation if the entrance was practicable and safe, of which he had expressed strong doubts. To my surprise I was ordered to go with him. We went quite close to the entrance, where we found the surf breaking entirely across it; and my own opinion concurred with that of the pilot that no attempt ought to be made. It was, however, a severe trial to make such a report. I had heard many of the officers treat the doubts of the pilot as the offspring of apprehension, and the weather was not yet so decidedly boisterous as to render it certain that an attempt might not be made, notwithstanding our report. Should such be the case and should it succeed, the imputations upon the pilot might be repeated upon me, and, unknown as I was, might be the cause of my ruin in the estimation of my brother officers. My sense of duty and propriety, however, prevailed over these apprehensions, and my report was decidedly against any attempt to enter the harbor at that time, and sustained all the objections of the pilot. These opinions were evidently received with much dissatisfaction by a majority, and with some murmurs, but the attempt was abandoned for the time, and the vessels weighed again to get beyond the view from the town before daylight. This was not done without some difficulty, as the gale increased rapidly. It continued for four or five days with

* The officers of the Intrepid were Lieutenant Decatur, commanding; Lieutenants Lawrence, Joseph Bainbridge, and Thorn; Midshipmen McDonough, Izard, C. Morris, Laws, Davis, and Rowe; and Surgeon Heerman. The Maltese pilot, Salvadore Catalano, afterwards became a sailing-master in the Navy.

great violence, and drove us considerably to the eastward, and at one time nearer the coast than was agreeable.

Our situation on board was far from comfortable. The commander, three lieutenants, and the surgeon occupied the very small cabin. Six midshipmen and the pilot had a platform laid on the water casks, whose surface they covered when they lay down for sleep, and at so small a distance below the deck that their heads would reach it when seated on the platform. The marines had corresponding accommodations on the opposite side, and the sailors had only the surface of the casks in the hold. To these inconveniences were added the want of any room on the deck for exercise, and the attacks of innumerable vermin, which our predecessors the slaves had left behind them. The provisions proved to be decayed and offensive. Fortunately our confinement did not continue long enough to affect our health or vigor.

On the morning of the 16th we again obtained sight of Tripoli, with light winds, pleasant weather, and a smooth sea, and stood in for the town. By arrangement the Siren kept far without us during the day, and her appearance had been so changed as to lull all suspicion of her being a vessel of war. The lightness of the wind allowed us to keep up all appearance of an anxious desire to reach the harbor before night, without bringing us too near to require any other change than the use of drags, which could not be seen from the city. All the crew were also kept below, excepting six or eight persons at a time, that suspicion might not be awakened by unusual numbers; and such as were visible were dressed as Maltese.

As the evening advanced our drags were taken in, so that we were within two miles of the eastern entrance at dark, the Siren being some three miles without us. The concerted arrangements were for the ketch to wait for the boats of the Siren to join us after dark, that they might accompany us to the attack; but as the sun descended the wind grew fainter, and there was good reason to apprehend that any delay in waiting for the boats might render it very difficult for the ketch to reach the ship. Decatur, therefore, determined to proceed without waiting, and accompanied his decision with the remark, "The fewer the number the greater the honor." One boat from the Siren, with six men, had joined us a few days before, and was still with us.

The final arrangements were now made, and the respective duties of the several officers, which had been previously allotted, were again specified and explained. The presumed number of our enemy was stated, and the necessity for our utmost exertions enjoined upon us.

The watchword "Philadelphia" was issued, to be used as a means of recognition; and as we advanced into the harbor strict silence was enjoined and observed. The injunction, however, appeared to be unnecessary. No one seemed disposed to enter into conversation, but to be absorbed by his own reflections. My own thoughts were busy, now reverting to friends at home, now to the perils we were about to meet. Should I be able to justify the expectations of the former by meeting properly the dangers of the latter? How was I prepared for the death which might possibly be my fate? These, with others of a somber character, mixed with calculations to secure a prominent position when boarding, passed rapidly through my mind; and the minds of others were no doubt employed on similar subjects. The officers and crew were directed to conceal themselves as much as possible, excepting some six or eight. Most of the officers could be distinguished by their dress, and they required concealment more than the sailors. Fortunately, owing to the loss of some articles, which had been replaced by loan from the crew, my own dress corresponded to theirs, which enabled me to keep near Decatur, who I supposed would naturally be among the first to leave the ketch. The wind wafted us slowly into the harbor, the water was smooth, and the young moon gave light enough to distinguish prominent objects. One battery was passed, the Philadelphia was in view near several smaller vessels, and the white walls of the city and its batteries were before us. We steered directly for the frigate, and at last the anxious silence was broken by a hail from her, demanding our character and object. Then might be seen the eager movements of the heads of the officers and crew who were stretched on the deck, ready to leap forward at the word of their commander, but still resting in silence. A conversation was kept up between the frigate and the ketch through our pilot, acting under the dictation of Decatur. We alleged the loss of our anchors during the last gale, which was true, as a reason for wishing to make fast to the frigate till morning, and permission was obtained; but just as the ketch was about coming in contact with the frigate the wind shifted, blowing lightly directly from the frigate, and it left us at rest abeam and about twenty yards from her. This was a moment of great anxiety. We were directly under her guns, motionless and powerless, except by exertions which might betray our character. The Siren's boat was, however, in tow, and was leisurely manned, and took a rope to make fast to the ship. She was met by a boat with another rope, when both were united, and each

boat returned to its vessel. This rope was passed along the deck and hauled upon by the crew as they lay stretched upon it, and the vessels gradually brought nearer each other. When nearly in contact the suspicions of the enemy appeared to be aroused, and the cry of "*Americanos!*" resounded through the ship. In a moment we were near enough, and the order "Board!" was given; and with this cry our men were soon on the decks of the frigate. The surprise had been complete; there was no time for any preparation, and the enemy made scarcely a show of resistance. A few were killed, one was made prisoner, and the remainder leaped overboard and probably reached their cruisers which were anchored near the ship. In less than twenty minutes the ship had been carried, the combustibles distributed and set on fire, and all our party again on board the ketch. By great exertions, the two vessels were separated before the fire, which was pouring from the ports of the ship, enveloped the ketch also.

Up to this time the ships and batteries of the enemy had remained silent, but they were now prepared to act: and when the crew of the ketch gave three cheers in exultation of their success, they received the return of a general discharge from the enemy. The confusion of the moment probably prevented much care in their direction, and, though under the fire of nearly a hundred pieces for half an hour, the only shot which struck the ketch was one through the topgallant sail. We were in greater danger from the ship, whose broadside commanded the passage by which we were retreating, and whose guns were loaded and were discharged as they became heated. We escaped these also, and while urging the ketch onwards with sweeps, the crew were commenting upon the beauty of the spray thrown up by the shot between us and the brilliant light of the ship, rather than calculating any danger that might be apprehended from the contact. The appearance of the ship was indeed magnificent. The flames in the interior illuminated her ports and, ascending her rigging and masts, formed columns of fire, which, meeting the tops, were reflected into beautiful capitals; whilst the occasional discharge of her guns gave an idea of some directing spirit within her. The walls of the city and its batteries, and the masts and rigging of cruisers at anchor, brilliantly illuminated, and animated by the discharge of artillery, formed worthy adjuncts and an appropriate background to the picture. Favored by a light breeze our exertions soon carried us beyond the range of their shot, and at the entrance of the harbor we met the boats of the Siren, which had been intended to coöperate with us, whose crews rejoiced

at our success, whilst they grieved at not having been able to participate in it.

The plan of attack prescribed by our commander was for united action to obtain possession of the ship, with the exception of a boat to intercept communication to the shore, and for the surgeon and a few men to secure the ketch to the ship. When possession was secured, each lieutenant, with a midshipman and specified men, was to receive a portion of the prepared combustibles, and distribute them in designated parts of the berth-deck and in the forward store-rooms, and a smaller party under a midshipman to do the same in the cockpit, and there await orders to set fire, that all might be done at the same time and give all a chance for safe retreat. The party for the cockpit was assigned to my charge. My object in keeping near Lieutenant Decatur, when we were approaching the ship, was that by watching his actions, I could be governed by these rather than by his orders when the boarding should take place. It was well that this course was taken, for Decatur had leaped to the main chain plates of the frigate, before the order to board was given. I had leaped with him, and, probably more favored by circumstances, was able to reach the deck by the time he had gained the rail. The enemy were already leaping over the opposite side and made no resistance; but Decatur, under the supposition that he was first on board, was about to strike me, when I accidentally turned and stayed his uplifted arm by the watchword and mutual recognition. On my way to my station, after examining the cabin, and when passing forward, we met again under similar circumstances. Passing through the wardroom, which I found deserted, I awaited in the cockpit the men who had gone for the combustibles. These were so delayed that we had none when the order was given to set fire; but, as they came a moment after, they were distributed, and fire communicated before we left our station. In the mean time the fire on the deck above us had communicated so rapidly that it was with no small difficulty and danger that our party reached the spar-deck by the forward hatchways. All the others had already rejoined the ketch, except Decatur, who remained on the rail till all others were on board; and the bow of the ketch had already swung off from the ship when he joined us by leaping into the rigging of the ketch.

The success of this enterprise added much to the reputation of the Navy, both at home and abroad. Great credit was given and was justly due to Commodore Preble, who directed and first designed it,

and to Lieutenant Decatur, who volunteered to execute it, and to whose coolness, self-possession, resources, and intrepidity its success was in an eminent degree due. The accident of having preceded others a few seconds, when all were on board within a minute, gave a prominence in public estimation to my own exertions, to which may be ascribed favorable opinions that probably had a beneficial influence on all my subsequent professional life. I was not, however, vain enough to feel that I deserved any particular merit from this accident, and could not but be conscious that I really deserved more for my faithful report against an attempt to enter the harbor when we first arrived than for an accidental precedence which had not cost me half the effort.

On our return to Syracuse the officers resumed their former duties. A merchant brig, mounting ten 4-pounder guns, was detained a few weeks after for breach of blockade, and fitted by order of Commodore Preble to act as a cruiser, under the name of the Scourge. She was under the command of Lieutenant Dent, the senior lieutenant of the Constitution. Henry Wadsworth was appointed to act as first and Ralph Izard as second lieutenant, and myself as master, on the 22nd of April, 1804. By this appointment more responsible duties were devolved upon me, which, at the same time, furnished means for more rapidly increasing my professional knowledge, and excited me more strongly to improve them.

We sailed from Syracuse early in May, for Tripoli, off which place we continued as one of the blockading vessels till the arrival of the commodore about the 1st of July, accompanied by two bomb-vessels and six gunboats borrowed from the Neapolitan government (which was also at war with Tripoli), and by some other vessels of our own squadron.

The necessary preparations for attack, and some unfavorable weather, occupied us till the 3d of August, on the morning of which the signal was made to prepare for battle. The Scourge, being useless for any offensive purpose, was anchored, and all the crew and officers, excepting two or three persons, were distributed to other vessels. I went to the Constitution. The daring attack by the gunboats under Lieutenants Stephen Decatur and Somers, and the capture of three of the enemy's gunboats against a superiority of nineteen to six, is a matter of history. Some apprehension was felt that these boats might be recaptured by the enemy, before our smaller vessels could cover them, and I was allowed to take the barge and assist in towing them

from under the fire of the batteries. When the firing had ceased I took Lieutenant Stephen Decatur to the boat of his brother James, who had been mortally wounded just as his opponent had surrendered. The latter had escaped in the confusion which was caused by his fall. We found him still alive, but apparently unconscious; and he expired just before we reached the ship on our return. I remained in the Constitution assisting in the ordinary duties till the 7th of August, when an attack was made on the town by the bomb-vessels and gunboats only, when I accompanied Lieutenant Decatur, with McDonough, in his gunboat. The current swept us to leeward, and prevented us from gaining the position which had been intended; and in endeavoring to change the direction of our line the vessels fell into much confusion from their unmanageableness in a sea-way, and left us exposed to the fire of the enemy for some time, without our being able to return it. At one time they formed and bore up as though they contemplated a close attack, but they soon hauled up again and beat back to the harbor. Our attack was of little injury to the enemy; and we lost one of the prize boats, which was blown up, and her commander, Lieutenant Caldwell, Midshipman Dorsey and eight men perished with her. Two other persons were killed in other boats, and six wounded, two of them mortally.

On the evening of this day the John Adams, Captain Isaac Chauncey, joined the squadron from the United States. By her, intelligence was received that a squadron was on its way to reinforce us, but under the command of Commodore Samuel Barron, who, from his rank, would necessarily supersede Commodore Preble. She also brought a commission as captain for Lieutenant Decatur, as a reward for his gallantry in the capture and destruction of the Philadelphia; but there being no appropriate command for him, he continued in command of the gunboats.

The arrival of a superior officer to supersede Commodore Preble was much regretted in the squadron. His zeal and activity, and his watchful care of the interests and honor of the country, and the adoption and vigorous prosecution of means, which afforded to officers opportunities for gaining honorable distinction, had caused all to forget or to pardon his violent ebullitions of temper, as a constitutional infirmity beyond his control. The commodore was also hurt at this requital of his exertions, which might easily have been avoided by the selection of junior officers, if there had been a very strong desire to continue him in the command; but it did not produce any

relaxation in his exertions. The next day, the 8th of August, 1804, I was appointed acting lieutenant of the brig Argus, Captain Isaac Hull, and joined her the same day. On the 9th I went with a flag of truce to take dispatches to the city, but was not permitted to pass the gunboats; still, I was able to discover some positions where gunboats could be secure from some of the batteries.

I was ordered to succeed Lieutenant Joshua Blake, the senior lieutenant, in the command of gunboat No. 3, which was manned from the brig. In an attack that was subsequently made, on the 3rd of September, the gunboats were occupied by a very distant cannonade which produced little effect and furnished no opportunity for individual distinction. The Constitution, however, made a vigorous attack on the town and batteries, and received considerable injury in sails and rigging.

On the 4th of September the ketch Intrepid, which had brought stores to the squadron, was filled with a hundred barrels of powder and a hundred and fifty loaded shells for the purpose of being taken into the harbor and exploded, with a view to shatter the castle and batteries, and destroy or injure the vessels. She was commanded by Lieutenant Somers, and accompanied by my old messmate, Henry Wadsworth, and Midshipman Joseph Israel and ten picked men. The ketch left the squadron after dark. Every person was anxiously awaiting the event, and about eleven the explosion took place, apparently near the entrance, instead of the bottom of the harbor, as was proposed. The concerted signal to denote the safety of the party was then waited for with increased anxiety; but the watchful eyes of all in the squadron looked for it in vain, till daylight came, and with it the conviction that they had been captured or had perished. The latter proved to be the fact. How, can never be accurately known; but the probability is that the explosion was premature and accidental, though at the time the general feeling ascribed it to design rather than to submit to disappointment and capture by boats supposed to have met and assailed them.

The weather having become unsettled, and the ammunition and other stores of the squadron being nearly exhausted, the gunboats and bomb vessels, with the vessels of the squadron, excepting the Constitution, Argus and Vixen, left the station on the 7th of September for Syracuse. On the 10th, the frigate President, Commodore Barron, and the Constellation, Captain Campbell, joined the squadron off Tripoli. Commodore Barron considered the season too far advanced

to justify any further attacks on the city, and on the 12th Commodore Preble, in the Constitution, left for Malta, with three Greek ships laden with wheat, that had just been detained for an attempted violation of the blockade. Of one of these ships I was placed in charge; and after our arrival at Malta I was allowed to live with the officers of the Constitution, during the quarantine to which all the ships were subjected. Commodore Preble left the squadron and returned to the United States in the John Adams.*

On the 28th of October, I was ordered to the President, as her junior lieutenant, by Commodore Barron, under whom I had commenced my naval career. We proceeded soon after to Syracuse, where the commodore remained while the ship made a cruise off Tripoli under the command of Commander George Cox. The discovery of a slight decay in one of the lower masts and in some of the other spars excited such a dread of danger in his mind that he left the station and returned to Syracuse. An exchange was then made by sending him to the Essex, and Captain James Barron took the President, which would leave him near his brother while the masts of the ship were under repair. These repairs occupied the greater part of the winter.

Hitherto my opportunities in the squadron for reading or study had been very limited. There were no books among the officers after I joined the Scourge, and few in the squadron devoted any part of their time to their use. It was my good fortune to find an exception in Lieutenant Daniel Murray of the President, and to obtain his friendship. He was a good classical scholar, well read on many subjects, conversant with the French language, and at this time studying the Italian. My fondness for reading had not been lost and it was now not only encouraged but usefully directed by Mr. Murray, whose library was placed at my disposal. My subsequent improvement may, in a great degree, be fairly attributed to his influence, and the elegance of his manners, his cheerful and amiable temper, and his high and firm principles furnished an example which excited a desire and even an attempt to imitate. He was five or six years my senior, and,

* The removal of Preble from his command, besides being unjust to him, and entirely uncalled for by any necessities of the service, was a piece of bad policy on the part of the government. Barron, apart from the state of his health, was in no way comparable to Preble as an officer. The ease with which a favorable treaty was negotiated in 1805 was chiefly due to the hot work which Preble had given the Tripolitans the year before.

though highly estimated as an officer, the gloomy prospects of the Navy, and his recent marriage, induced him to resign in 1811, and devote himself to agricultural pursuits. He sustained his high character through life, but steadily declined all official stations, though he might have represented his district in Congress, or filled the gubernatorial chair of his state, at any time during many years prior to his death, which took place in 1841.

We had the pleasure, for several weeks during this winter, of having Washington Irving as a companion in our mess, from which parties were made to visit other cities in Sicily. The indisposition of Commodore Barron had deprived him of any active participation in the proceedings of the squadron, and on the 23rd of May, 1805, he resigned the command of it to Commodore Rodgers, the next in rank. On the 3rd of June, a peace was concluded with Tripoli by Colonel Lear, who had been authorized by the President to negotiate.

After the resignation of the command by Commodore Barron he made a visit from Syracuse to Catania and Mount Etna, and selected several of the officers to accompany him. As one of the number I had an opportunity of passing ten or twelve days on this excursion. The Commodore selected the village of Mascalucia for his residence, hoping for advantage to his health from its mild temperature, it being situated at about an equal distance from the base and summit of the mountain.

A party was soon made up to ascend to the crater. We left the village after an early dinner, and reached a goat-herd's cabin in the woody region about 9 P. M. Here we halted for a few hours, and, resuming our march by a path which kept us in Indian file and led us occasionally along the brink of deep precipices, we found ourselves at the foot of the crater by early dawn. We here awaited the rising of the sun, as a position less liable to be obscured by the smoke than upon the crater itself.

The morning proved unusually favorable, being perfectly clear, and allowing us to view the sun rising, in appearance, out of the Adriatic below us, while the full moon was sinking into the sea beyond the western shores of Sicily. Distances seemed to be nearly lost; the Faro of Messina lay at our feet, and the eastern shores to Cape Passaro, with the windings of the intermediate harbors, were like distant tracings on a map. The island itself, notwithstanding its hilly character, appeared, from our superior elevation, like an unbroken plain, variegated by the greater lights which rested on the elevations,

and the shadows which the early rays of the sun threw beyond them. After an hour or two passed in the contemplation of these novel scenes, the ascent of the crater was commenced. Our path led us at first across an old stream of lava, which resembled ice that had been broken and driven together by some violent force, and when the cake had been pressed into every variety of elevation and inclination, had been fastened there by new congelation. In this broken surface the edges of the lava were sharp or rough, and in many places required the use of hands as well as feet to advance upon or over it. When this was crossed we arrived at the upper cone, the surface of which was composed of scoriæ and lava stones which had been thrown from the crater by its eruptions. The ascent was quite steep; and from this cause, the looseness of the surface, and the rarity of the atmosphere, it was found to be very difficult. As we approached the summit, it was found impossible to advance more than fifty or sixty yards without stopping to recover strength and wind to go further. Our party consisted of eight, and of these only five reached the edge of the crater, the strength of the others having been exhausted at from two to three hundred yards from it. At or near the point we reached, the inner wall of the crater appeared to be nearly perpendicular, and we could discover no limit to its depth. Heavy columns of smoke ascended at short intervals, and the crater was not entirely free from it at any time. The circumference of the crater at that time was estimated by us at about three-quarters of a mile; but there is no doubt that its dimensions and appearance are frequently changed by the action of the forces within and below.

The peculiarity of this elevated and desolate region which struck us with the greatest force was silence, more perfect and profound than we had ever before witnessed or conceived. There was nothing there endowed with life excepting ourselves,—neither bird, beast, nor vegetable. Our descent from the crater was more rapid and less fatiguing, but not entirely free from danger, as the large stones that were lying in the scoriæ were easily detached from their bed, and rolled down the cone with great velocity, rousing others in their path, and sometimes spreading wide enough to endanger any who should be in advance of them. After recrossing the lava we mounted our mules again, and reached the village in time for dinner.

At this place, and just as I was leaving it to return to the ship, the news of the peace reached us by Captain Bainbridge, who had taken the earliest opportunity to visit Commodore Barron. The terms of

this peace were satisfactory to the government, and probably were preferable to renewed hostilities, the success of which might be doubtful; but there was a general feeling among the officers that with such greatly increased forces a more formidable demonstration for attack might have spared us the payment of even the small sum which was granted by the treaty, and thus deprived the Pasha of all pretext for boasting of having obtained a ransom for the prisoners who had fallen into his power.*

It was soon determined that the frigate President should return to the United States with Commodore Barron. Some changes took place among the officers, which left me the third lieutenant. Lieutenant Murray joined the Essex, Captain Bainbridge. The greater part of the officers who had been released from Tripoli took passage in the President, which increased the wardroom mess to twenty-two. Apprehending inconvenience from late sittings of so many unemployed persons, the officers of the ship requested and obtained an order for the extinguishment of all lights in the wardroom at 10 P. M., which was soon adopted in the service as a general rule. A few days were passed at Algesiras in obtaining supplies. When passing Tarifa, with our colors flying, a few hours after leaving Algesiras, the Spanish gunboats opened fire upon us, and threw many shot over us. As they were covered from our fire, the only notice taken of their conduct was to display the Spanish flag under ours,—a proper return for their gratuitous insult.

Commodore Barron and our passengers left us at Hampton roads, and the ship proceeded to Washington, where the crew were paid off. Late in September the officers were placed on short leave of absence, but were ordered to hold themselves in readiness for service. A short time was spent among the friends of fellow officers who resided in Alexandria and Baltimore, and a short visit to the family of Lieutenant Murray at Annapolis, which I had promised him to make. I determined to devote a portion of my present leisure to the study of the French language and to general reading, and selected Providence,

* The treaty was signed June 4, 1805. It stipulated for the exchange of prisoners, man for man, and for the payment of $60,000 by the United States as a ransom for the excess of American prisoners in the hands of the Tripolitans. About three hundred Americans were held prisoners in Tripoli at the time, and we had captured about one-third of that number of Tripolitans. The treaty made no stipulation in regard to other payments, in the form of annual tribute or otherwise.

where I had a few early acquaintances, as a residence. Here I found an able instructor, and the kindness of several families soon gave me access to a society of young persons, many of whom were distinguished for their acquirements and talents, as well as for the charm of their social qualities.

The reputation which had been gained by the Navy in the Mediterranean operated here as a favorable introduction for the officers who had been employed there, and the attentions which fell to my share might have affected me injuriously, if a consciousness that they were given first to the officer and not to the individual had not kept all vanity in check. The attentions were, however, gratefully received, and naturally excited a wish to deserve them by the prudence and propriety of my conduct.

My studies and my pleasures were interrupted early in February by an order to repair without delay to New York, for duty in the brig Hornet. This was, of course, promptly obeyed, though with much regret; for, besides the separation from agreeable companions, my progress in French was too small to allow me to pursue the study alone with the hope of much success. I found that my old commander, Dent, was to command the Hornet, with Trippe and Marcelline for the other two lieutenants, which placed me as the second. Mr. Skipwith, our consul at Paris, soon joined us, and about the last of March, 1806, we sailed to convey him to Lorient in France. We had a tempestuous passage, and on one occasion very narrowly escaped foundering by a heavy sea which broke just short of us, carrying away the stern boat. We arrived safely, however, early in May, and left again about a fortnight afterwards for the Mediterranean, after having received many civilities from the naval officers and other inhabitants.

On our passage we fell in with part of the English blockading squadron off Cadiz, and had another instance of the insolence of their naval officers. A ship had been detached to speak us, from which a boat came on board as usual. The officer, however, whether by instruction or not he did not state, requested of Captain Dent that the crew might be called up for his examination. The only reply he received was an order from Captain Dent to Lieutenant Trippe to have the side manned for him, and a formal "Good morning"; and he wisely did not wait for any further information. We proceeded on our way without further interruption, but with very indignant feelings.

The remainder of the year 1806, and until August 1807, was passed in visiting the ports of Malaga, Alicante, Leghorn, Naples, Cagliari,

Palermo, Messina, Syracuse, and Malta, with an occasional visit to the Barbary ports of Algiers, Tunis, and Tripoli. A large proportion of our time was idly and unprofitably passed at Syracuse, where there were few objects of interest or means for rational enjoyment. Though unrestrained by orders, our commander could not be persuaded to visit the Adriatic, or the Grecian and Turkish ports, which the younger officers were very desirous to examine. It even required some management to obtain a visit of ten days at Naples and of a week at Palermo. We were more fortunate at Alicante, where we passed several weeks very pleasantly in the society which was furnished by the estimable family of our consul, Mr. Montgomery, and in that of his brother and the foreign consuls resident in the city. Our stay at Malaga was also prolonged a little by the attractions of the family of Mr. Kirkpatrick, our consul at that place. My introduction to society in Providence, and the opportunities which offered at Lorient and at the ports we visited in the Mediterranean, had placed me at ease in the company of ladies and given me a fondness for their society which was favorable to me in all respects, especially by exciting my endeavors to increase my information. By great perseverance I acquired the ability to read French with facility, and then used works in that language to read history and study naval tactics and other subjects connected with the higher branches of my profession. I was unable, however, to speak it, and seldom made the effort.

On the 1st of August, being off Malaga on our way to Gibraltar with the Constitution, we met a vessel which gave us the confirmed account of the attack on the Chesapeake by the Leopard.* This induced us to anchor at Malaga, where official information reached us by special conveyance on the 17th of August. The Constitution sailed the same evening for the United States, and we were dispatched to have all stores disposed of that remained at Malta and Syracuse

* The Chesapeake was attacked by the English frigate Leopard June 27, 1807, off the entrance of Chesapeake bay, the object of the Leopard being to obtain the surrender of any deserters from the English squadron that might be on board the Chesapeake. Owing to the negligence of her officers, and from other causes, the Chesapeake had put to sea wholly unprepared for action, and she was able to make little or no resistance. After receiving the Leopard's fire for fifteen or twenty minutes, she hauled down her colors. Her crew were mustered by an English lieutenant, and four men were taken from her. The Leopard then sailed away, and the Chesapeake returned to Hampton roads. The British government disavowed the act and made reparation for it, though after considerable delay.

before the news should reach those places, under the impression that immediate war would be the consequence of such an outrage.

Our duties were successfully accomplished, and, having touched at Leghorn and received some money that was in the hands of the United States agent, we left the Mediterranean with all dispatch, and following the southern passage by the trade winds arrived at Charleston, South Carolina, late in the month of November.

Public indignation had abated so much before our arrival that an immediate war was no longer apprehended, and our vessel remained unemployed at Charleston during the winter. The officers received a full share of the hospitalities for which the inhabitants of this city were distinguished, and my opportunities for mingling with the refined and intelligent society thus made accessible were not neglected.

Seeing little prospect of active employment, I obtained leave to visit Washington in May 1808, where permission was given me by the Department to visit my friends, and subsequently I received an order to report to Captain Bainbridge for duty at Portland, Maine. My health had been impaired at Charleston, and I traveled leisurely by way of New York and Albany to visit my parents in Montgomery County. The effects of service in different climates for five years, and the usual effects of transition from youth to manhood, had so changed my appearance that even my mother did not recognize me on my arrival. The time at length arrived when duty required me to separate myself again from the family and to bid a farewell, which proved to be the last that was to be given by the mother to whom her family owed so much and were so deeply attached. * * * * On my journey, I devoted some days to visiting Northampton, Hartford, and Middletown, and passed a week at Woodstock, where there were a few who still recollected me, although there had already been numerous changes in the inhabitants and in their situations and employments. From Woodstock I proceeded to Providence to renew the acquaintances from which I had derived so much pleasure a few years before.

In Boston I again met my uncle, N. Morris, who had been appointed a purser by Commodore Preble when in the Constitution,—an appointment which was subsequently confirmed by the Department. He was now in the advanced stages of consumption, which closed his life a few months later.

On the 1st of August, 1808, I reported for duty at Portland, where I became an inmate in the same house with Captain Bainbridge and his family, and Lieutenants Thorn and Cox. We were without any

duty for some months, which I sedulously devoted to reading and to practice in map delineations.

The existing embargo had caused the ruin of most of the merchants of Portland and thrown a large proportion of the inhabitants out of their accustomed employments. These special causes produced a bitterness of party feeling, which was sufficiently strong between the political parties generally, where no such causes existed. Having never taken any part in the politics of the country, and having personal friends in both of the parties, it was not difficult for me to feel and express more favorable opinions of both than was acceptable to their respective opponents; and social intercourse had been so much disturbed by party feelings that my neutral conduct excluded me, for a time, from the circles of both extremes. This was gradually overcome, however, and afterwards my time was passed with much pleasure as well as advantage with some families of both parties.*

In November Captain Bainbridge was ordered to Washington, and the lieutenants, Thorn and Cox, left the station on leave of absence. A few days after, directions came for the equipment of one of the gunboats in the harbor, for the purpose of preventing evasions of the embargo, which I was instructed to enforce. This placed me on a service which was peculiarly unpopular and liable to bring me into unpleasant if not dangerous collisions with the sailors and mercantile part of the community. It was fortunate for me that I had already formed acquaintances to whom I could explain the necessity for my obedience and my desire to avoid all unnecessary inconvenience to others in the performance of my duties. These persons made my sentiments generally known, and by carefully preventing any abuse of power by those under my command, and giving such unremitted personal attention as prevented any infraction of the law, I was fortunate enough to escape the censure of both parties and any complaints from individuals. In the course of the winter, the other nine gunboats were equipped and manned and placed under my orders, and I had the satisfaction, when called to other duties in the spring, of being informed that an application had been forwarded to the Department

* The Embargo act was adopted in December, 1807, and repealed at the end of February, 1809. It prohibited the departure of any vessel from any port of the United States, bound to any foreign country, except foreign armed public vessels, and foreign merchant ships in ballast or with only such cargo as they might have on board when notified of the act. The act authorized the President to employ officers and vessels of the Navy to carry it into effect.

to leave me in my command, as one who had gained the confidence and favorable opinion of the influential persons of both political parties. This was a gratifying compensation for the very great exposure necessary during the winter, which had affected my health and excited serious apprehensions of dangerous pulmonary disease.

Captain Bainbridge having completed the duty for which he left Portland, was ordered to the command of the frigate President, whose repairs had just been commenced at Washington. By the same mail in which he informed me of his appointment, I received an order to the same ship, but to open the rendezvous at Portsmouth till further orders. Captain Bainbridge informed me that my position was to be the executive officer or first lieutenant. This information, though gratifying to professional pride, caused me much uneasiness and some alarm, for I had doubts of my ability to perform such responsible duties to the satisfaction of my commander, or to my own credit. My last service had been in a small vessel, and when rating as a lieutenant in a frigate, my duties were only those of a watch officer; and in no case had those of an executive character devolved on me except in my recent charge of a gunboat. I therefore wrote to Captain Bainbridge stating my doubts, that he might select a more experienced officer if he should prefer it. His answer, which was flattering and encouraging, left me no option but compliance with the order. Six weeks were passed in Portsmouth, during which I received the melancholy information of the sudden death of my mother from pleurisy.

I joined the President in May, 1809, and commenced my duties with a determination to supply deficiencies of professional knowledge, as far as practicable, by unwearied attention and diligence. The ship was so much decayed that many of the bottom planks had to be renewed, as well as the copper, and all her equipments were new. These latter were all to be prepared and put in place under my personal direction, and my exertions fortunately obtained the approbation of my commander, whose own attention and activity were well calculated to excite the energies and diligence of others. Notwithstanding all exertions the ship did not reach Hampton roads till September. From that place she proceeded to New York and received some articles which were still deficient. Captain Bainbridge had been authorized to wear a commodore's pennant, and two cruises of five or six weeks each were made on the coast during the winter, where the tempestuous weather allowed of few comforts, but gave full employ-

ment to the crew, and greatly increased their efficiency and skill in the maneuvers of the ship. James Biddle was the second, William Burrows the third, G. C. Read the fourth, A. S. Wadsworth the fifth, and C. W. Morgan the junior lieutenant. In May, 1810, Captain Bainbridge left the ship in the Delaware, under a furlough, to attend to his private affairs, and she proceeded under my charge to Hampton roads. Lieutenant Biddle left for the Syren, and Lieutenant Burrows on a furlough. Captain Hull had been selected to succeed Commodore Bainbridge, but Commodore Rodgers, his senior, having expressed a desire to exchange to the President from the Constitution, it was authorized, and on the arrival of the latter ship in the roads a complete exchange of the officers and crew was made, and Captain Hull took command of the Constitution. The remaining part of the summer and the autumn were passed in the Constitution in cruising on the coast and in the Delaware river and Boston harbor.

The winter of 1810–11 was passed with the President and Congress in the harbor of New London. Captain Hull was absent a considerable part of the time, which devolved some additional duties upon me, but as we had but little other employment than the usual gun exercises, I found time to make a tolerable survey and chart of the harbor with the imperfect instruments at my command. After a short cruise on the eastern part of the coast and a visit to Boston, the ship proceeded to Chesapeake bay, in May 1811, and anchored off Annapolis, ready to receive on board Mr. Barlow and convey him as our envoy and minister to France.* August arrived before we were joined by Mr. Barlow and his family, composed of Mrs. Barlow and her sister, Mrs. Baldwin.

A pleasant passage enabled us to land them at Cherbourg in September. The ship soon proceeded off the Texel, where we landed specie as payment of part of the public debt due in Holland. On our return a few days were passed in the Downs, where the British naval officers were civil. After another short detention at Cherbourg

* Joel Barlow, the well-known author of the Columbiad and the Vision of Columbus. Barlow had served as a chaplain during the Revolution. From 1788 to 1805 he was in France and in England, occupied with various political and financial schemes, in the latter of which he made a large fortune. Part of the time he was Consul of the United States at Algiers and Tripoli. He was appointed Minister to France in 1811, and gained a reputation for considerable diplomatic ability. He died in December, 1812, in Poland, having been sent for by the Emperor, then on his Russian campaign.

the ship took Mr. Russell to England as Chargé d' affaires.* We anchored at Spithead, where there were many British ships of war. Captain Hull accompanied Mr. Russell to London for a short visit. At this place no offers of civility were received from the British officers. Some circumstances occurred which at one time threatened serious difficulties, though none actually took place.

Very late one night a boat came from an English frigate that was lying near us, whose officer, on being shown to me, in the absence of Captain Hull, presented the compliments of the captain of the Havannah, with the information that a deserter from our ship had just reached the ship under his command. Thanks were returned for the information and he was informed that the man would be sent for in the morning. When this was done his delivery was declined, without an order from the admiral. The second lieutenant was sent to the flag-ship for such an order, but was informed that the admiral was on shore. It seemed proper to make a personal demand, and for that purpose I waited on the admiral, Sir Roger Curtis. My request for the man was answered by the question whether we would surrender British deserters who should reach our ship; to which I could only say that Captain Hull would probably be willing to accede to any agreement that should be mutually advantageous. The admiral then observed that the man had claimed protection as a British subject, and, under these circumstances, he was bound to retain him; and without other evidence than the man's own assertion, as he said in reply to a question. I had therefore only to make a formal demand and take leave. Anxious to prevent further desertions, additional sentries were placed and every vigilance enforced. About midnight I was awakened by the discharge of the sentries' muskets, and the cries of a man in the water near the ship. He was soon picked up and brought on board. He had deserted from our neighbor, the Havannah, and, on being asked his country, answered, in the richest Irish brogue, "An American." This was sufficient. A boat was immediately sent to the Havannah to reciprocate the politeness of the preceding evening, and the next morning we had the satisfaction of assigning the same reason and the same testimony, for refusing a demand for his restitution from the captain and admiral. Captain Hull returned about noon the same day. The subject had become known

* Jonathan Russell, Chargé d' affaires at Paris, was transferred to London on Barlow's arrival in Paris. He was subsequently Minister to Sweden, and one of the commissioners that negotiated the treaty of Ghent.

on shore and was freely discussed, with threats of the use of force, if the deserter should not be otherwise restored by us. Signals were made and two frigates lying at some distance weighed and anchored very near us, in positions that, with three other vessels close by, rendered it very difficult for us to get under way without getting foul of them. As Captain Hull was obliged to return to the shore and intended to sail in the morning, he directed me to remove the ship on the turn of the tide to a position outside of the English ships. This was accomplished, though we were very near getting foul of the ships near us; but we had barely anchored before we were followed by the same two frigates.

The captain and some American gentlemen, as passengers, came on board about sunset and preparations were made for getting under way. Supposing it very possible, if not probable, that force might be used against us, the crew were beat to quarters, the decks lighted up and the ship prepared for action, before the anchor was weighed, when the crew were again returned to their quarters, and we stood out of the roads without molestation or further threatening movements. The next morning we anchored in Cherbourg. I was sent to Paris, to await the despatches which were to be sent home in the ship by Mr. Barlow. This was about the middle of November. I remained in Paris about six weeks, during which the necessity of holding myself in readiness to leave at any hour confined me to the city itself; but that afforded ample scope for pleasant occupation for a much greater length of time.

Paris at that period contained many of the masterpieces of art which had formerly been the pride of different nations, and which were soon to be restored by the same chances of war that had enabled Napoleon to collect them. The examination of these occupied many of the hours at my disposal. Mr. Barlow had many acquintances among the distinguished residents of the city, besides those who visited him in consequence of his official situation. Through his kindness his house was always open to me, and I met many persons there who were no less interesting from their personal character than from the distinguished position they had formerly held in society. It was there that I first met La Fayette, who frequently passed a quiet evening at the house, referring with Mr. and Mrs. Barlow to scenes and persons connected with our own revolution and that of France, which excited deep interest in those who had the good fortune to be present. Here also, among many others, were assembled the "Belle et Bonne"

of Voltaire, Madame Villette,* the Archbishop of Paris,† Grégoire,‡ Marbois,§ and General Kosciusko, the soldier and advocate of liberty in both hemispheres. Kosciusko, like La Fayette, was then residing in the country near Paris, in great retirement, out of favor with the government, if not under surveillance, and entered very little into society, where there were few who sympathized with him in their feelings and opinions, or where any expression of them could be made without danger. At Mr. Barlow's they found safety and sympathy, and other inducements which frequently brought them to his domestic circle. My introduction to Kosciusko was unexpected, and his manner made a strong impression on me. Mrs. Barlow and myself were sitting in the parlor on a dark, stormy day, when the servant announced a person whose name was not distinctly heard. He was followed into the room by a small man, in an old brown overcoat, who immediately rushed to Mrs. Barlow and gave her an embrace which was cordially returned. Both seemed to be greatly excited, and for some time I stood an unnoticed spectator. At last Mrs. Barlow presented me to the general, as an American officer, which gained me also an embrace, and the expression of his gratification at having once more met with one. Then laying both hands upon my head, he invoked the blessing of the Almighty upon me, with great fervor and solemnity, to my no small astonishment and confusion.

Although I had seen Napoleon tolerably near when he occasionally

* Reine Philibert de Varicourt, Marquise de Villette, born 1757, died at Paris in 1822. She was the adopted daughter of Mme. Denis, and lived at Ferney, in Voltaire's household, until her marriage in 1777 to Charles, Marquis de Villette. Her husband was an active member of the Girondin party, and only his ill health saved him from proscription. He died in 1793. Madame Villette passed more than a year in prison, and after her liberation devoted the rest of her life to works of benevolence.

† Jean Siffrein, Cardinal Maury, Archbishop of Paris, 1810–1815.

‡ Henri Grégoire, born 1750, was a clerical deputy in the States General of 1789, and took a leading part in the Revolution. He was violently opposed to the monarchy, but maintained throughout his adherence to the church. During the Empire, he exerted no great influence in public affairs, but he formed one of the small minority in the Senate opposed to the Emperor. He died in 1831.

§ Barbé-Marbois, the diplomatist and financier of the Empire, had served some time in America and had married there. In 1803 he conducted the negotiations in reference to the Louisiana cession.

reviewed troops in the Carrousel, my desire was great to see him more nearly still. This desire was at last gratified under very favorable circumstances. The Emperor and the imperial family received all the foreign diplomatic corps and the great officers of the Empire, on the 1st of January, 1812. The foreign ministers had the privilege of presenting their countrymen on this occasion, and with several other Americans I accompanied Mr. Barlow. The diplomatic corps and their countrymen assembled about 11 A. M., in a large hall on the lower floor of the palace of the Tuileries, where coffee and other slight refreshments were served. About noon they were notified to proceed to the hall of the throne. Ascending the grand staircase between the line of the guards, every step having one at each end, we were conducted through a hall in which the city authorities were assembled, another containing the general officers of the Army and Navy and civil officers of corresponding ranks, and a third containing the Marshals and other superior dignitaries of the Empire and high officers of the household; this opened to the hall of the throne. The throne was at the farthest extremity. The Emperor stood near it, and at a short distance his grand chamberlain and one or two others. Our procession entered slowly and ranged itself rather on one side of the hall, the ambassador entitled to precedence near the head of the hall, and the others in succession, each having his suite near him, and a small space between each suite to keep them distinct. A few minutes after the arrangement was completed, the Emperor advanced to the ambassador highest in rank, Prince Schwartzenberg from Austria, and addressed a few remarks to him, after which the strangers of that embassy were presented. The same course was pursued with each separate legation, and occupied from three to five minutes with each. When the Emperor had thus received all, he returned slowly along the line, returning the salutations of the different legations as he passed, but without conversing with any excepting with the Americans. When opposite to Mr. Barlow, he observed, "I perceive the English government has returned the seamen formerly taken from one of your ships of war," (news of which had been received a few days before); to which Mr. Barlow replied, "Yes, Sire, and in a manner honorable to our country." With a peculiar smile and a slight toss of the head, he rejoined, "So long as you do not injure the commerce or the revenue of England, you may do whatever besides that you may choose with her," and passed on. Having resumed his station near the throne, he bowed low to the assemblage, upon which they

retired, keeping their faces towards him till they had reached the door of exit, when they returned to the hall where they had assembled.

The legations were now conducted to another part of the palace where the same ceremonies were repeated with the Empress Marie Louise. Here the antechambers and hall of reception contained many ladies mingled with the household officers. The Empress appeared to be quite ill at ease, and to perform her part in the exhibition with considerable embarrassment, and with scarcely an attempt at conversation. Our detention was not long, and we proceeded next to the apartments of the Emperor's sister, the Queen of Italy.* The comparisons between her and the Empress were favorable to the Queen. Apparently quite at her ease, with an animated face and gracious manner, she maintained the necessary conversation without hesitation or difficulty. The legations then assembled at the chapel, in a side gallery, while the Imperial family occupied the front during mass, which occupied about half an hour.

Hortense, the daughter of the late Empress, and Queen of Holland, resided in a different part of the city, and the legations next visited her, but without any connection with each other. Her court was small. She received us with great affability and grace, and impressed us with a belief in her amiability of temper and benevolence of character. On being informed that I was about to return to the United States, she sent many kind messages to Mrs. Hay, the daughter of Mr. Monroe, with whom she said she had been at school, and whom she pronounced to be "très très aimable."

The Queen of Joseph of Spain and another sister of the Emperor still remained to be visited, according to the strict rules of etiquette; but the evening had arrived, and Mr. Barlow having assured us that Joseph's Queen was "the very fag-end of royalty," we accepted his proposition to leave them and accompanied him to partake of his dinner.

The great object of interest in this varied and brilliant scene was Napoleon himself; but it is difficult to describe his appearance and the expression of his countenance, or the impression which they made upon my mind. In height he was about five feet, eight inches. He had already exchanged the slight and slender figure of the conqueror of Italy for a fulness which verged closely upon corpulency. His movements were slow, but easy and dignified: the expression of his

* Caroline Bonaparte, the wife of Murat.

face generally grave and composed, the upper portion indicating deep thought, and the mouth and lower part, firmness and decision. His eyes were dark, clear, and penetrating, but without much brilliancy; and their motion was slow when passing from one object to another. His smile gave an agreeable and amiable expression to his face, which could hardly have been expected from its generally cold and fixed character; but a smile seemed to be of rare occurrence, as it only appeared for the moment when he last addressed Mr. Barlow. On this occasion he was not, as usual, in uniform, but dressed in velvet coat and breeches, white satin vest, white silk stockings, shoes, and white cravat of lace, and carried a hat in his hand, with one side turned up, secured by a loop which supported a drooping white ostrich feather, and ornamented by a single diamond of great size and brilliancy. The hilt of his small sword and the buttons of his coat, and the knee and shoe buckles were set with diamonds. The general character of his dress was in good taste, expensive but free from all gaudiness, and, compared with that of the officers of the court, appeared remarkable for its simplicity.

Such was Napoleon as he appeared to me on the 1st of January, 1812, surrounded by the representatives of all the nations of christendom, excepting England, and the acknowledged arbiter of Europe. Success had hitherto crowned all his enterprises, and further opposition to his will required a boldness which bordered on rashness. But the war with Spain had been commenced and one with Russia was then contemplated, which led to a general coalition, that in less than four short years deprived him of all power and left him at the mercy of his enemies for the remainder of his life.

Mr. Barlow's despatches having been completed, I left Paris with them on the evening of the 2nd of January, and soon after joining the ship at Cherbourg she sailed for the United States. After a very tempestuous and unpleasant passage of forty-two days we reached the entrance of the Chesapeake, and I proceeded to Washington with the despatches. About three weeks were passed at the seat of government, during which I became known to the President and the different secretaries and many members of Congress, and joined in the gaieties which are usual there during the session of Congress. From the conversation of the members of the cabinet, it was apparent that war might be soon expected with Great Britain, unless she repealed the order of council under which our commerce was plundered by her numerous cruisers, and unless those cruisers were further restrained from insulting infringements of our nationality by firing upon and

capturing vessels, within our jurisdiction, as recognized by international law.*

Under these circumstances, I was desirous of some situation that would leave me ready for the command of a small vessel, should war take place, and at the same time relieve me for a time from the incessant and laborious duties in which I had for some years been constantly engaged. The Secretary readily acceded to my wishes, giving me orders to join Commodore Bainbridge, who had just been ordered to the Navy yard at Boston; assuring me that when next employed at sea, it should be in command of some vessel.

My expectation of relaxation was, however, disappointed, for the yard was found to require unremitted exertion to bring it into a situation of even moderate efficiency and order. Before this was accomplished my hope of command was also destroyed by an unexpected order to repair to New York to meet the Constitution and rejoin her in my old situation of senior lieutenant. As the Constitution was still in the Potomac, where she had gone for slight repair, the commodore permitted and advised my proceeding directly to Washington, in the hope of having the order revoked by recalling the promise of the Secretary to his recollection.

Using all despatch, I met the news of the declaration of war just before reaching Washington.† This event was not calculated to diminish my desire for a separate command, and the revocation of my orders was readily granted. To my surprise and mortification, they were peremptorily renewed a few days after. Indignant at such conduct, which was not explained, and which seemed inimical to my interests, I formed the proper determination to give prompt obedience and make a cruise, but, before leaving the city, to make application for an appointment in the Army which was then forming. I accordingly made an application for a lieutenant-colonelcy of artillery, and lodged, in support of it, the recommendations of the members of Congress for Connecticut and Rhode Island, and of a member from New York and Massachusetts. Having done this, in the course of the morning I obtained an interview with the Secretary of the Navy, informed him of

* Captain Morris does not mention the most serious international grievance, that of impressment, which at this time, had been carried so far that English cruisers, as the Guerrière in 1811 off Sandy Hook. stationed themselves near our ports and took undoubted American citizens out of American coasters, within a few miles of our shore.

† War was declared June 18, 1812.

my decision, and action, and left the city in the afternoon, in a vessel taking stores to the ship. I joined her near the mouth of the Potomac on the 25th of June.

The equipments of the ship were still very imperfect. Only a part of her guns were mounted, the complement of men was greatly deficient, those on board were not yet stationed, and, of course, were totally uninstructed in any special duties. Captain Hull used all exertions to supply the deficiency of men and stores, while the other officers were unceasing in their efforts to complete the equipments, and exercise and train the men to their various duties, but more especially with the guns. The ship was taken opposite Annapolis for more convenient intercourse with Baltimore and ports to the eastward, and on the 5th of July we began to work down the bay, still continuing to receive men and stores till we passed out to sea on the 12th of July.

The ship had been ordered to New York to meet and join other vessels under the command of Commodore Rodgers, and our course was directed accordingly. We had proceeded beyond the Delaware, but out of sight of the land, when, on the afternoon of the 16th, we discovered four vessels, at a great distance to the NW., and a single ship to the NE., from which quarter a light wind was then blowing. The wind changed to the southward about sunset, which brought us to windward, and we stood for the ship, the wind being very light. The chase was evidently a frigate, and the first impression was that she might be a part of Commodore Rodgers's squadron. By 11 P. M., we were within signal distance, and it was soon apparent she was not an American vessel of war. There being no apprehension that a British frigate would make any attempt to avoid an engagement, Captain Hull felt justified in delaying any nearer approach till daylight of the 17th, when our newly-collected and imperfectly disciplined men would be less likely to be thrown into confusion.* The ship was accordingly brought to the wind with her head to the southward and westward, under easy sail, with a light wind from the NW. The other ship did the same at about two miles distance. The watch not on duty were allowed to

* The single frigate was the Guerrière. It was fortunate that Hull decided to wait, as, even supposing that he had been victorious in the engagement, he could not have escaped the rest of the squadron. The Guerrière mistook her own consorts, from which she had been separated, and which at the time were some distance to leeward, for the squadron of Commodore Rodgers, and hence avoided an engagement.

sleep at their quarters, and the officers slept in the same manner. As the following morning opened upon us, it disclosed our companion of the night to be a large frigate just without gunshot, on the lee quarter, and a ship-of-the-line and three other frigates, a brig, and schooner, about two miles nearly astern, with all sails set standing for us, with English colors flying.* All our sails were soon set, and the nearest frigate, fortunately for us, but without any apparent reason, tacked and immediately wore round again in chase, a maneuver that occupied some ten minutes, and allowed us to gain a distance, which, though short, proved to be of the utmost importance to our safety. By sunrise our ship was entirely becalmed and unmanageable, while the ships astern retained a light breeze till it brought three of the frigates so near that their shot passed beyond us. The distance was, however, too great for accuracy, and their shot did not strike our ship. Our boats were soon hoisted out, and the ship's head kept from the enemy, and exertions were made to increase our distance from them by towing. This, and occasional catspaws or slight puffs of wind, enabled us to prevent their closing, but as their means were equal to ours, we could gain nothing. A few guns were fired from our sternports, but so much rake had been given to the stern that the guns could not be used with safety, and their further use was relinquished. All means were adopted which seemed to promise any increase of speed. The hammocks were removed from the nettings, and the cloths rolled up to prevent their unfavorable action; several thousand gallons of water were started and pumped overboard, and all the sails kept thoroughly wet to close the texture of the canvas. While making all these exertions, our chances for escape were considered hopeless. For many years the ship had proved a very dull sailer, especially during the late cruise, and it was supposed that the first steady breeze would bring up such a force as would render resistance of no avail; and our situation seemed hopeless. At about 8 A. M., one of the frigates called all the boats of the squadron to her and, having arranged them for towing, furled all sails.

* The squadron consisted of the 64-gun ship Africa, Captain Bastard; the frigates Shannon, 38, Captain Broke; Guerrière, 38, Captain Dacres; Belvidera, 36, Captain Byron, and Æolus, 32, Captain Lord James Townsend. The brig was the U. S. brig Nautilus, which had sailed from New York a few days before, under the command of Lieutenant William M. Crane. When only a few hours out, she fell in with Broke's squadron and was captured. During the chase of the Constitution Crane was a prisoner in the squadron, and a witness of the escape of the American frigate. The schooner mentioned in the text was another prize of the squadron.

This brought her towards us steadily and seemed to decide our fate. Fortunately for us a light breeze filled our sails and sent us forward a few hundred yards, before her sails could be set to profit by it. With our minds excited to the utmost to devise means for escape, I happened to recollect that, when obliged by the timidity of my old commander, Cox, to warp the President in and out of harbors where others depended on sails, our practice had enabled us to give her a speed of nearly three miles an hour. We had been on soundings the day before, and on trying we now found twenty-six fathoms. This depth was unfavorably great, but it gave me confidence to suggest to Captain Hull the expediency of attempting to warp the ship ahead. He acceded at once, and in a short time (about 7 A. M.) the launch and first cutter were sent ahead with a kedge, and all the hawsers and rigging, from five inches and upward, that could be found, making nearly a mile of length. When the kedge was thrown the men hauled on the connecting hawser, slowly and carefully at first, till the ship was in motion, and gradually increasing until a sufficient velocity was given to continue until the anchor could again be taken ahead, when the same process was repeated. In this way the ship was soon placed out of the range of our enemy's guns, and by continued exertions when the wind failed, and giving every possible advantage to the sails when we had air enough to fill them, we prevented them from again closing very near us. The ship which we had first chased gained a position abeam of us about 9 A. M. and fired several broadsides, but the shot fell just short of us, and only served to enliven our men and excite their jocular comments. The exertions of neither party were relaxed during this day or the following night. There was frequent alternation of calms and very light winds from the SE., which we received with our heads to the southwestward. When the wind would give us more speed than with warping and towing, the boats were run up to their places, or suspended to the spars in the chains by temporary tackles, with their crews in them, ready to act again at a moment's notice. At daylight of the second day, on the 18th, it was found that one frigate had gained a position on our lee bow, two nearly abeam, one on the lee quarter about two miles from us, and the ship-of-the-line, brig and schooner, three miles from us in the same direction. The wind had now become tolerably steady, though still light. The frigate on the lee bow tacked about 4 A. M., and would evidently reach within gunshot if we continued our course. This we were anxious to avoid, as a single shot might cripple some spar and impede our progress. If we tacked, we might be ex-

posed to the fire of the other frigate on the lee quarter; but as she was a smaller vessel the risk appeared to be less, and we also tacked soon.

In passing the lee frigate at 5, we expected a broadside or more, as we should evidently pass within gunshot; but, from some unexplained cause, Lord James Townsend in the Æolus of 32 guns suffered us to pass quietly, and tacked in our wake, while the others soon took the same direction. We had now all our pursuers astern and on the lee quarter, and as the wind was gradually increasing, our escape must depend on our superiority of sailing, which we had no reason to hope nor expect. Exertions, however, were not relaxed. The launch and first cutter, which we dared not lose, were hoisted on board at 6 A. M., under the directions of Captain Hull, with so little loss of time or change of sails that our watching enemies could not conceive what disposition was made of them. This we afterwards learned from Lieutenant Crane, who was a prisoner in their squadron. The sails were kept saturated with water, a set of skysails was made and set, and all other sails set and trimmed to the greatest advantage, close by the wind. The ship directly astern gained slowly but gradually till noon; though, as the wind increased, our good ship was going at that time at the unexpected rate of ten knots an hour. At noon we had the wind abeam and as it gradually freshened, we began to leave our fleet pursuer. Our ship had reached a speed of twelve and a half knots by 2 P. M. Our hopes began to overcome apprehension, and cheerfulness was more apparent among us.

Though encouraged we were by no means assured, as all the ships were still near and ready to avail themselves of any advantage that might offer. About 6 P. M., a squall of wind and rain passed over us, which induced us to take in our light sails before the rain covered us from the view of the enemy; but most of them were soon replaced as the wind moderated. When the rain had passed, we had evidently gained a mile or more during its continuance. Still the pursuit was continued and our own ship pressed forward to her utmost speed. The officers and men again passed the night at quarters. At daylight, on the morning of the 19th, our enemies had been left so far astern that danger from them was considered at an end, and at 8 A. M., they at last relinquished the chase and hauled their wind. Our officers and crew could now indulge in some rest, of which the former had taken little for more than sixty hours. Captain Hull deservedly gained much reputation for this difficult retreat from a greatly superior force, when superior numbers and other circumstances gave the ene-

my great advantages. The enemy seem to have been desirous at first of bringing so many of their ships upon us as to render all resistance hopeless, and thus obtain our ship so little injured as to be immediate-employed by them. If they had concentrated their efforts at an earlier period to bringing up some one of their ships within fair range, or had adopted our plan of warping at any time during the early part of the chase, they could hardly have failed to inflict such damage as would have prevented our escape, after our dependence was reduced to our sails.* The result may be remembered as an evidence of the advantages to be expected from perseverance under the most discouraging circumstances, so long as *any* chance for success may remain.

As access to New York was impracticable the ship proceeded to Boston, where she arrived on the 27th of July. Her arrival was reported by Captain Hull, by letters addressed to New York, and to the Department, but the apprehension of being blockaded by the enemy's squadron induced him to determine to wait no longer than to ascertain if Commodore Rodgers had left any orders for him at New York. This was found not to have been the case, and we sailed again on the 1st of August, having employed the intervening days in renewing our supplies and improving our preparations for active service. The decision of the captain proved fortunate, for the day after our departure orders arrived from Washington to await further directions. We proceeded leisurely to the eastward, along the coasts of Nova Scotia and Newfoundland, where we captured and destroyed several of the merchant vessels of the enemy, and improved the time in careful exercise of our new crew at the guns, to which all the officers gave the most minute and careful supervision.

Leaving Newfoundland and standing SE. across the track of vessels bound from the West Indies to Europe, having reached lat. 41° 43′ N., and long. 56° 6′ W., a sail was discovered about 2 P. M., on the 19th of August, under our lee, which was soon made out to be a frigate and an enemy. She continued her course by the wind to the southward under every sail, while we approached with a fresh westerly wind so as to preserve our windward position. When within about two miles, at 5 P. M., we shortened sail, sent our royal yards down, reefed the topsails, and prepared for action. When these preparations were completed,

* James, quoting Marshall, says that Captain Byron, in the Belvidera, kedged, "bending all his hawsers to one another, and working two kedge-anchors at the same time, by paying the warp through one hawse-hole as it was run in through another opposite." *Naval History*, v. 371.

we bore up and steered for the enemy's quarter. He also displayed his colors, three ensigns, and as we closed at 5.05, he fired his broadside and wore ship. His shot did not then reach us, and we changed our course a little, to clear his quarter again, and at 5.20, hoisted our ensign and a jack at each mast-head. This induced another broadside, and another change of tack from the enemy, which was repeated two or three times, and we occasionally returned a few shot from our bow guns. As their maneuvers prolonged our separation, Captain Hull, at 6, directed the ship to be steered directly for the enemy and the main top-gallant sail to be set. The enemy now bore up gradually to nearly the same course as ourselves, before the wind, but with our greater quantity of sail we speedily closed upon his larboard quarter, and passed to his beam at about two hundred yards distance, gradually approaching still nearer. Both ships opened their fire as the guns could be brought to bear, about 6.05, and in about ten minutes we had the satisfaction of seeing the enemy's mizzenmast fall. This retarded her velocity and we were gradually ranging ahead, when at 6.20 our helm was put hard to port to cross her bows and rake her. The loss of braces, with the spanker and mizzen-topsails disabled, prevented our coming to as quickly as we desired, but still we had time to give two raking broadsides before her jib-boom crossed our quarter-deck, and we bore up to prevent her crossing our stern. With her bowsprit and jib-boom slightly entangled in our lee mizzen rigging, she fell astern of us rather on the lee quarter. As the bowsprit afforded a convenient passage for boarding, such an attempt seemed very possible in her crippled condition, and, for the purpose of ascertaining if her men were collecting, I got upon the taffrail. The appearances induced me to suggest to Captain Hull that men should be called to repel boarders, which was done. Believing that advantage might result from keeping the enemy in his then position, I was attempting to pass some turns of the main-brace over her bowsprit, when I received a ball through the body, which threw me on deck and left me stunned for some minutes. Lieutenant Bush of the Marines, who was standing on the deck near the taffrail, was killed about the same time by a ball through the head, and the Master Alwyn slightly grazed by one on the shoulder.

Having been lifted to my feet, I was able in a few minutes to resume my duties. In the meantime, the ships had separated. Shortly after, the enemy's fore and mainmasts went by the board, and at 6.30 she fired a gun to leeward in token of surrender. No further

effectual resistance could be made by her, and the importance of examining into and repairing our injuries induced Capt. Hull to stand off a short distance for this purpose. When it was completed, the ship again approached the enemy, at 7 P. M., to receive the formal acknowledgment of conquest, which had been virtually secured when her masts were destroyed and her flag was struck a little before sunset. When the ships were separated and the action over, there was no further occasion for my presence, and my voice began to fail and my wound to become painful; and I accordingly surrendered the charge of the deck to the second lieutenant, Wadsworth. After some directions for extinguishing a slight fire in the cabin which had been produced by the enemy's wads, when she was nearly in contact, I went to the cockpit for examination. This was soon done, and during the remainder of the night, pain nearly deprived me of all consciousness. The cessation of fever was followed by great debility which confined me to my bed for some weeks after our return to Boston, where we arrived early in September, having on board Captain Dacres, his officers and crew. Our prize, the frigate Guerrière, had been destroyed soon after the fight.

This capture, the first of consequence which had been made from the enemy, produced great excitement and gratification throughout the country. The Guerrière had been on our coast, and her commander was reported to have expressed a great desire for conflict with any of our frigates, and even to have sent messages to that effect. Our success was hailed as an earnest of what might be expected from others, an expectation that was nobly realized by the actions of the United States with the Macedonian, the Wasp with the Frolic, the Constitution with the Java, and the capture of several others on the ocean, and of the enemy's squadrons on Lake Erie and Lake Champlain. These repeated captures, from an enemy who had for a long time been accustomed to unvaried success, gave us a high naval reputation abroad, and obtained for the Navy a favorable opinion in our own country, which it had not enjoyed before.

The causes of our success became the subject of much inquiry and were variously estimated. By some they were assigned to the different motives which operated on the seamen of the two countries, ours being elevated by patriotism, while those of the enemy were depressed by the cruelties of impressment. The enemy sought for consolation under their defeat in the greater size of our vessels, and their heavier armament. In some actions these causes undoubtedly existed,

and among them, that of the Constitution and the Guerrière, but even these were insufficient to meet the great disparity in the losses sustained by the contending vessels.*

The remote cause, as it appeared to me, was to be found in the confidence of our enemy and in the distrust of ourselves to contend successfully against them: in the neglect of careful exercise, which resulted from the enemy's confidence, resting on former success; and, on our part, in the unwearied attention of our officers to devise and bring into daily exercise every improvement which might increase the chances of success against a Navy, to which we might soon be opposed as an enemy, and upon which there were so many injuries and insults to be avenged for the honor of our country. This expectation and feeling were of general, almost of universal, prevalence among our officers, and led them to a unity of purpose and action which could not fail of producing important results. Their number was so small that each knew almost every other, and there was scarcely a feeling of unworthy jealousy, though much of generous emulation, among those of corresponding ranks. To these advantages may be added the greater resources of our seamen than is usual with those of other nations. Many of our seamen have acquired trades before

* The following table shows the relative force of the combatants:—

Constitution: 468 men and boys.

	No. of guns.	Weight of shot.
	32 long 24-pounders,	768 pounds.
	24 32-pound carronades,	768 "
Total,	56	1536 pounds.

Guerrière: 263 men and boys.

	No. of guns.	Weight of shot.
	30 long 18-pounders,	540 pounds.
	2 long 9-pounders,	18 "
	16 32-pound carronades,	512 "
	1 18-pound carronade,	18 "
Total,	49	1088 pounds.

The force of the Constitution in guns was, therefore, fully one half greater than her opponent's. In men it was nearly double; and in the strength and thickness of her spars and sides, the Constitution was decidedly superior. Considering the character of naval battles, however, the difference of force alone is not sufficient to account for the result of the engagement, in which, after a contest of three-quarters of an hour, the Guerrière was reduced to a total wreck, with more than a fourth of her crew killed and wounded (seventy-three in all), while the Constitution suffered little injury, and had only fourteen casualties among her officers and men.

they begin their maritime pursuits, and, in case of necessity, carpenters, smiths, and others, are to be found in numbers among our crews, who can render most valuable aid in repairing damages; which could only be done in other services by the few who are usually specially provided for such purposes.

But the great source of our success was undoubtedly the superior management and direction of our guns; and that the English and other governments were satisfied of this is sufficiently evident by the careful attention they have since continued to give to this branch of the naval service.*

On the arrival of the ship at Boston, August 31, I was landed for my more comfortable accommodation. All former neglects were soon effaced and all recent exertions unexpectedly rewarded by the receipt of an appointment, from the President, as a captain in the Navy, bearing date the day of the capture of the Guerrière. This unexpected advancement over a whole grade, which had only the precedent of Decatur, was considered by some as beyond my merits; by still more, as an injudicious departure from the usual routine; and by all those over whom I had been advanced, as fully justifying all their exertions to prevent its confirmation by the Senate. It was quite as unexpected by me as by any one, and I should have felt well satisfied if promoted to commander. Some of my best friends advised me to decline it; but the intended opposition of others was well known, and would leave such a relinquishment open to an imputation of a desire to obtain the credit for moderation, which might, in fact, have been induced by apprehension of eventual failure of confirmation. I preferred the hazard to such a course, but determined to take no step whatever to gain friends in the Senate, and to abide by its decision; and this was approved by several of my old companions, over whom, by a fortunate accident, I had been thus advanced. By orders of the 5th of October,

* In regard to the difference between the two navies in the matter of gunnery practice, James says: "Highly to the credit of the naval administration of the United States, the crews of their ships were taught the practical rules of gunnery; and ten shot, with the necessary powder, were allowed to be expended in play, to make one hit in earnest." On the other hand, "the generality of British crews, as compared with any one American crew, were miserably deficient [in] skill in the art of gunnery. While the American seamen were constantly firing at marks, the British seamen, except in particular cases, scarcely did so once in a year, and some ships could be named on board of which not a shot had been fired in this way for upwards of three years."—*James*, *Naval History of G. B.*, v. 373, 374.

I was assigned to the command of the Adams, then under repairs at Washington, and directed to join her when my health should be restored. Obtaining a leave of absence, I visited my maternal grandparents and my sister Lucy, at Middlebury, Vermont. From Middlebury my journey was to Albany, where I passed a few days and was made acquainted with Governor De Witt Clinton and different members of the Legislature.

The day before we reached Albany two gentlemen were conversing upon the capture of the Guerrière, and one of them stated many occurrences during the action which were entirely new to me. For convenience and ease I wore a jacket in travelling, and no part of my dress entitled me to much consideration from its appearance. I remarked, however, that I was recently at Boston, and having seen many who were in the action, none of whom had mentioned the facts he stated, which from their character would have been generally known and circulated, if true, I apprehended he must have been misinformed upon the subject. He replied, rather superciliously, that he had no doubt his means of information were quite as good as my own, and being properly asked for his authority he gave the name of a young midshipman whose station in action I knew prevented the possibility of his witnessing the facts he had communicated; but I urged the subject no further. Among the Senators to whom I was presented the next day, at the Capitol, were my two travelling companions, and our mutual recognition was not a little embarrassing, though no reference to our former conversation was made by either. Leaving Albany I passed a few weeks in visiting my father and his family and other relatives in Montgomery and Otsego Counties. I then proceeded to Washington, arriving there November 20.

The Adams was still under repair and not in a situation to require my personal attention. The winter was therefore passed in the gaieties of Washington society, which brought me into a general acquaintaince with the members of Congress and the resident public officers, and enabled me to reap many advantages from their conversation, as well as pleasure from a free intercourse with the younger and gayer portions of the residents and visitors.

My occupations were not entirely frivolous, however, as my opinions, with those of other captains, were not infrequently required on subjects which demanded careful deliberation and involved interests of no small importance. Among these was the expediency of introducing ships-of-the-line as a part of the force proposed to be authorized. In

an examination before the naval committee of the Senate I made it dependent upon the intention of having a *permanent* Navy, or a force for temporary purposes to be laid aside and resumed occasionally. If the former was proposed, the ships-of-the-line were desirable as a nucleus and pledge of permanency, by which such confidence could be given as would draw into the service the best materials for officers which the country could supply; while measures indicating a want of permanency would only draw to the Navy those who wished to use it till something should offer of greater advantage. The committee decided for a permanent Navy, and on their report six ships of 74 guns were authorized. My appointment remained before the Senate till the very close of the session, when it was confirmed, after giving Lawrence and Jones precedence of rank, which the President's original appointment did not contemplate. This arrangement was due to the former services of Lawrence, who had been the second in command at the destruction of the Philadelphia, and of Jones, who had just captured the Frolic, when in command of the Wasp.*

I was not insensible to the fact that my late unprecedented and unexpected advancement was due rather to accidental circumstances, and with a view to stimulate others by the example of my reward, than to any peculiar merits or unusual good conduct on my part. The honors which had been bestowed upon me left me indebted to the service and the country—a debt which it would require all my future exertions to repay, and imposed an obligation upon me to devote my time and talents with zeal and assiduity to such duties as might be assigned to me; and it was my earnest purpose to act accordingly.

Unavoidable circumstances delayed the equipment of the ship till the 8th of May, 1813, when we left the Navy yard and proceeded towards the mouth of the Potomac. We had no expectation, however, of getting to sea during the summer, as the lower part of the Chesapeake was constantly occupied by several of the enemy's ships. The Adams had been originally a small 32-gun frigate, but when recently repaired, she had been sawed asunder and fifteen feet additional length given to her. Heavy upper works were given to the spar-deck, altogether disproportioned to her breadth and capacity below water. It was soon apparent that her want of stability would not permit any pressure of sail, and several additions of ballast did not increase it. I had earnestly requested that she might be fitted as a

* October 18, 1812. Both ships were captured later in the same day by the Poictiers.

corvette, and this desire was now much increased; but for the present the Secretary would not consent to gratify it.

Several small vessels and gunboats were placed under my command, with which to protect the shores of the Potomac from marauding boat expeditions, and to give notice of any attempts by the enemy to ascend the river in force.

On the 15th of July, at 1 A. M., one of the lookout vessels communicated the intelligence that the enemy had entered the river with fourteen sail, and were ascending it with a fair wind.

We were then lying near fort Washington. The information was immediately forwarded to the Department, and the ship moored opposite to the fort, with three gunboats in company. By 10 A. M. the Secretary of the Navy and Commodore Tingey arrived on board, and at 2 P. M. we all went on shore, where we met the Secretaries of State and of War.

About fifteen hundred troops, new recruits and militia, arrived in the course of the day. The Secretary of State left in the afternoon for Port Tobacco, and the Secretary of the Navy came on board and passed the night, but returned to Washington the next morning.

Some 32 and 18 pounder guns arrived from the city during the day, for which our officers and men constructed a temporary platform on the beach, and soon had it ready for service. It was placed in charge of our first lieutenant, A. S. Wadsworth, with forty men and a detachment from the army. The Secretary of War, General Armstrong, remained near the fort till the 20th of July, but would never give directions for any additional defensive works, although it was admitted that the fort could offer little effective resistance to a heavy ship or to any party that might land. The Secretary stated as his opinion that the enemy would never seriously attempt to penetrate to the city, which offered no sufficient motive for such an enterprise. At last, upon its being urged that such an employment would be more useful for the troops than idleness, he sanctioned a plan which I prepared at his request; but, as the enemy began to move down the river soon after, the works were never begun. While busily occupied with these various and pressing duties I remodelled the signal book of the Navy, at the request of the Secretary of the Navy, who wished it done immediately, under the impression that the former one had fallen into the enemy's hands, by the capture of the Chesapeake.* It was the

* The Chesapeake was captured by the Shannon, June 1, 1813.

work of less than a fortnight, which, with the attendant circumstances, will account for its acknowledged imperfections. The enemy left the Potomac about the 22d of July and the Secretary of War returned to Washington. The troops were soon after sent to Annapolis, where it was supposed the enemy might attempt to land.

The Adams had been surveyed by a board of officers, and her insufficiency for sea service had been recognized by them, but she was kept employed in the river till the 12th of August. She was then taken to the Navy yard for alteration, while the officers and two hundred and twenty men, with a detachment of about a hundred marines, were placed under my command and sent to Annapolis as an additional protection to that city. Service in and near the forts,* which were situated near the water, in and opposite the place, had produced attacks of intermittent fever, which affected nearly all of the detachment, and rendered upwards of seventy unfit for duty, before we returned to Washington, on the 18th of September. The alterations of the ship were not completed until the 18th of November, during which time I was employed first upon a court of inquiry held at Newcastle, upon Commander Angus, and afterwards at Boston, in preparing, in conjunction with Commodore Bainbridge, tables of dimensions of the spars and rigging and the allowances of spare stores for the different classes of vessels in the Navy, with which the service had not before been provided. The ship had now been converted to a corvette of 26 short and light 18 pounder guns, with a complement of two hundred and fifty persons. A. S. Wadsworth, F. A. Parker, J. R. Madison and T. A. Beatty, were the lieutenants; G. B. Mc Culloch, master; W. S. Rogers, purser; Gerard Dayers, surgeon; Thomas Williamson, assistant surgeon; and Samuel E. Watson, marine officer. All were young, the senior lieutenant about twenty-four, and the junior under nineteen years of age, and all of us unmarried.

The enemy were constantly in force near the outlet of the bay, and there was no other chance for our getting to sea but by passing them undiscovered. This could not well be accomplished except with strong, fair winds, and dark or thick weather. As the season advanced the ship was taken to the mouth of the Potomac, ready to take advantage of any favorable opportunity. Our situation here was not very agreeable, being always exposed to an attack by superior force, with all the rivers closed above us by ice.

* Fort Madison, on the northern bank of Severn river, and fort Severn, the present gymnasium of the Naval Academy.

After one attempt, which was rendered abortive by change of wind and weather, on the 18th of January we left the mouth of the Potomac, at 5 P. M., with a strong NW. wind, and cloudy weather, and occasional squalls of snow. All the lights in the bay had been discontinued, and the two persons who acted as pilots were imperfectly qualified for the duty. The rate of sailing was so rapid that correct soundings were not obtained, and it was only by a fortunate chance that we were not carried upon the shoals of the middle ground. The discovery of a supposed light nearly ahead induced us to haul by the wind for the purpose of avoiding too close a proximity, and enabled us to discover our error but without giving us the means of determining our true position. In a very short time we shoaled suddenly and almost immediately struck the ground two or three times with considerable force from the swell. Change of course fortunately took us into deeper water, when our two pilots differed widely as to our place in the bay, and it became necessary to depend entirely on my own judgment, which happened to prove correct. The shocks which the ship had received were sufficient to justify apprehensions of injuries that might be troublesome or dangerous at sea, which, with the uncertainty of our position, rendered it a matter of considerable hazard to persevere; but everybody was willing to encounter these risks for the chance of escaping the species of imprisonment to which we had been so long subjected. The attempt was accordingly renewed, and at a little past midnight we passed near enough to the enemy in Lynnhaven bay to discover two ships at anchor; but a speed of twelve and a half knots carried us past so rapidly that we were probably not seen by them, and when daylight again broke upon us, neither enemy nor land was in sight.

The Secretary had suggested, but not positively directed, an examination of the western shores of Africa, from cape Mount to cape Palmas, after passing to the eastward as far as the Canaries and cape De Verdes, and then westward, near the equator, about to Noronha, and along the north end of the West India islands to some port in the United States. This track was followed, but with little success, our only capture being three brigs, one laden with wine and fruit, one with fish, and one with palm oil and ivory. The two first of these were destroyed, after taking out as much of the wine and fruit as we could accommodate. The other was given up to the captain, to receive our prisoners, after the latter had been paroled and after the vessel had been cleared of the ivory and such parts of her other lading as

might be useful to us. On our return passage we had just taken possession of a ship from India with a cargo of rice when thick weather, clearing up, discovered a convoy of twenty-five sail, and two ships of war, so near that we were compelled to recall our men, relinquish the ship, and attend to our own safety. The other vessels that we met were neutrals, as nearly all English vessels were then obliged to sail with convoy.

May 1, 1814, we arrived at the mouth of the Savannah river, nearly destitute of provisions and water. The ship drew too much water to ascend to any place of safety, and was anchored off the lighthouse, and every exertion was made to complete our supplies. On the 2nd, the brig Epervier, lately captured by the Peacock, under the command of Commander Warrington, arrived, and passed up to Savannah, after we had taken from her all the provisions and stores she could supply. The Peacock arrived on the 4th, and followed her prize. Intelligence was sent to us, on the 6th, that the enemy was in force off Cumberland island, and aware of our exposed situation. On the 8th, having obtained all the provisions that the city could furnish, we warped the ship out to sea, against a light wind, and made sail for another cruise. We had reason to expect that the Jamaica convoy would pass soon, and therefore took a position near the outlet of the Gulf stream, between Matanilla and Florida. We met them on the 24th of May. The convoy force consisted of one 74-gun ship, two frigates and three brigs, which, with the smooth, pleasant weather and the favorable season of the year, deprived us of all chance of successful operations against them. After keeping near them for two days, we left them, and, crossing the bank of Newfoundland, stood towards the coast of Ireland. Two brigs were captured on the passage and destroyed. On the 4th of July we were close in with the mouth of the Shannon, and afterwards kept close in with the shore to the northward till the 9th. We saw not a single vessel. We then bore up to the southward and, when in the parallel of the channel, we met a frigate, which gained fast upon us for nearly the whole of a day, owing to light winds and a head sea. At night we let the lower anchors drop from the bows, and otherwise lightened the ship by throwing over some small guns we had taken from prizes. We towed during the night, and gained two or three miles. The next day a good breeze soon enabled us to leave our pursuer, the ship making thirty-one miles in three hours, very close-hauled to the wind. The absence of our anchors was evidently of great advantage in sailing.

On the 19th, we fell in with two frigates, which we were able to bring abaft the beam by steering northward. One of them soon gave up the chase, but the other continued it for forty hours, during which we ran four hundred miles of latitude, without perceptibly increasing the distance between the ships. Advantage was therefore taken of a short squall, during the second night, to change our course, by which we lost sight of her. From the time the ship passed Newfoundland, it was almost continuously so wet that the occasions were very rare when the clothing of the men could be dried. This weather, the long period in which the men had been deprived of all fresh vegetables and obliged to use salted food, with a very small daily allowance of water, had introduced the scurvy, and by the 25th of July several deaths had taken place, and thirty were rendered unfit for duty; and all were so much affected by it that a return to some friendly port became indispensable. Our expectations had been greatly disappointed, for we had anticipated active and successful employment so near the coasts and harbors of our enemy; and now we were about to return from a second cruise, without either profit or fame, for which even the consciousness of honest endeavor to render service afforded us little satisfaction.

On the passage homeward, a ship, brig, and schooner were captured and destroyed, after taking a few bales of furs from the ship, which was from Quebec. On the 16th of August we obtained soundings on our eastern coast, and at that time the number of our sick had increased to fifty-eight, many of which were dangerous cases of scurvy.

Our object was now to reach some of our eastern ports, and our course was directed for Portsmouth, New Hampshire. Foggy weather had prevented accurate observations for latitude or longitude during the last two or three days, but the soundings corresponded to our supposed position. We therefore pressed sail during the night of the 16th of August with foggy weather and steady breeze, which carried us ten and eleven miles an hour. Soundings at midnight again confirmed our estimated place, which we supposed to be about sixty miles from cape Ann. Upon the supposition that we might meet with an enemy the prisoners were placed in the hold, and, during the night, for greater security, the officers and men slept at quarters. Arrangements were nearly completed for heaving to and sounding at 4 A. M., when the lookout forward announced "breakers," and in a moment after the ship was felt to have struck. Notwithstanding her velocity the shock was not severe, but indicated that the ship had been stop-

ped by running upon rather than against a rock. Still, danger was to be apprehended that the ship would fill, and the first thought was to liberate the prisoners from the hold of the ship. The first conjecture was that we had struck on Cashe's ledge, and the reflection that, in case the ship should founder, its distance from the land would render it impossible for a great portion of the crew to reach it by our boats caused some of the most painful moments of my life. It would have been a relief to my own feelings if a sacrifice of my own life could have assured me of the preservation of the others. But their chances for safety depended upon well-directed exertions and not upon personal sacrifice. On examination it was found that the ship was resting forward on a slippery rock, upon which she had been raised six feet, while over the stern there was a depth of seven fathoms. The boats were immediately hoisted out, by which time the daylight dawned, and the fog dispersed for a few minutes, showing us a perpendicular rocky cliff about a hundred yards from our bows. Even this was some relief, as it gave assurance of the safety of life to the crew. Examinations were made for a considerable distance, and one small landing was discovered, through a very narrow passage between rocks, where there was a small level space under the cliff above high water mark.

The sick and prisoners were landed here with some sails and materials to form a shelter, and provisions, water, and medicines for their use. The purser and second medical officer were landed with them. The water continued tolerably smooth, and it was found the tide was nearly ebbed when we grounded and its rise might enable us to extricate the ship. While waiting for this many articles were landed for preservation, in case the ship could not be kept afloat, which had become very doubtful, as the water rather gained on the pumps. All the spare spars were got out, and formed into two rafts, in case such aid should be required to float the crew, and an anchor was let go to keep the ship in place if she should be removed from the rocks.

In the meantime we could gain no information of our locality; the air was still filled with a dense fog which obscured all objects, and no place could yet be found where the cliff could be scaled. The rising tide increased our hopes of floating the ship from the rock, and about noon, after some heavy shocks, we were able to heave her off, and she swung to her anchor. All the pumps were now worked with vigor, and it was found that they rather gained on the leak. This point established, it was determined to endeavor to take the ship to sea. The

direction of the wind rendered it very difficult to avoid the rocks close under our stern, but it was accomplished, and we returned on our former track as nearly as we could, occasionally passing very near rocky dangers for nearly two miles, when we finally reached deep water. Our utmost exertions, with pumps and buckets, for two hours, freed the ship from water, but the use of force pumps continually was necessary to prevent its gaining upon us. We were now once more safe from the dangers of the shore, but ignorant of our position, and of the extent of the danger to which the ship was exposed by her recent injuries, and we were liable, at any moment, to meet with enemies who we supposed would be cruising in our vicinity.

The men were restationed at quarters, a change rendered necessary by the absence of those left on shore; the spare spars and boats were hoisted in and stowed again, the confusion of articles restored to order, and the ship again presented the appearance of efficiency by sunset. In the course of the night the fog dispersed, and the sun was bright in the morning. Land was in sight, but, to our surprise, it showed we were near Mount Desert, instead of the neighborhood of Portsmouth or Portland.

During this exciting day, when our safety depended so much on the proper and skillful performance of all operations which our situation required, nothing could exceed the coolness, activity, order, and general good conduct of all the officers and crew; and to that good conduct, under Divine Providence, the preservation of the ship was mainly due. On several occasions any confusion, neglect or mistake, would have prevented the success of our exertions, and left the ship a hopeless wreck. The crew was composed of better men than are usually collected; the officers were zealous and well-disposed, and all had been acting together long enough to inspire confidence, the only sure source of power in time of danger.

In the course of the night the fog deepened, and the morning discovered to our view the rock of Mount Desert, instead of the coast between Portsmouth and Portland which we had expected to see. This great difference was undoubtedly owing to one of those strong currents that sometimes sweep along that coast, which, in this case, as we afterwards learned, washed an English brig as far from her supposed situation as we had been taken from ours.

We were now exceedingly anxious for the sick who had been landed. Many of the islands in our neighborhood were uninhabited and it was very possible they might have been left upon one of these, where their

situation would soon be very unpleasant. Two small fishing vessels were met with and sent in different directions to search for them, while we proposed to reach the Penobscot as soon as practicable. About 8 A. M. a sail was discovered to windward standing directly for us, and it was soon evident that she was a vessel of war, but our relative positions prevented us from ascertaining her force. When she had approached within a mile or two she hauled to the wind and showed herself to be a brig of war of 16 guns. Though in a situation that rendered it desirable to avoid any action at that time our course was continued, as though in chase, till by tacking we could gain the entrance of the Penobscot, where we left the chase to pursue her way.*

Our justification for this course was the scorbutic condition of the crew, which, by the report of the surgeon, was such that even a slight wound must destroy life; the leaky state of the ship, which required the constant use of the pumps; and, the great probability that the leaks would be much increased by the shock of a cannonade from her guns, after the severe strain which her hull had received.

We entered the Penobscot during the night, and were gratified in the morning by the information that our prisoners and sick had all been safely conveyed to Camden. The security of the prisoners, as well as the comfort of the sick, was mainly due to the purser, W. S. Rogers, in whose charge they had been left, and who exhibited on this occasion the energy and judgment and kindness, and care for the welfare of others for which his after life was so much distinguished.

Information having reached us that an attack upon Castine was apprehended, we proceeded up the river to Hampden, as a place of greater safety, from which it was supposed that any small force might be excluded by the population near the river. The ship was dismantled, her armament and stores landed, and preparations were in progress for heaving the ship out to ascertain and, if possible, to repair her injuries, when, on the 1st of September, intelligence was received by express that sixteen sail of the enemy's vessels had entered the bay. They had captured Castine, thirty miles below us, and their immediate advance up the river was contemplated.† Requests for assistance

* The "chase" was the English brig-sloop Rifleman, which gave intelligence of the presence of the Adams to Admiral Griffith's squadron.

† The expedition, under the joint command of General Sir John Sherbrooke and Rear Admiral Griffith, was composed of the 74-gun gun ship, Dragon, Captain Robert Barrie, the frigates Endymion and Bacchante, the sloop Sylph, and ten transports, It sailed from Halifax on the 26th of August, and on the 31st

were forwarded to Brigadier-General Blake, of the militia, and a number of men were assembled that evening and on the following day. By great exertions nine of our guns were placed in battery upon an adjoining hill, but without protection, and with only a loose platform; fourteen were ranged on a wharf which raked the channel below, and one commanded the communication between the two batteries.

At sunset of the 2d two sloops of war, a transport tender, and ten launches, under command of Captain Barrie, had arrived within three miles of us, and about three hundred and fifty troops had been landed under Colonel John.* Our means of defence, besides those already mentioned, and our ship's company, were about three hundred and seventy militia, imperfectly armed, and about thirty U. S. Infantry, who had just arrived, under command of Lieutenant Lewis, from Castine. In a meeting of the militia officers which I had been requested to attend there was so little said to give confidence in any effectual assistance that directions were given to have arrangements privately made during the night for destroying the ship, in case of being obliged to abandon her.

The night of the 2d was rainy and chilly. The militia had been posted in one line across the road about half a mile towards the enemy and kept under arms after midnight. This road passed through the village about three quarters of a mile from our battery and crossed a bridge over a creek. The creek was in our rear, and was fordable below the bridge, near low tide. We had been compelled to take this unfavorable position by the weakness of the bridge, which could not be strengthened in time to allow the guns to be taken over it.

The morning proved very foggy, upon the shore, and the marines were stationed between the hill battery and the militia, at distances from each other which would allow communication to be passed by

was joined by the 74-gun ship Bulwark, the frigate Tenedos, and two brigs, the Rifleman and Peruvian. Its first object was Machias, but upon learning of the arrival of the Adams, it was diverted to the Penobscot.

* According to James, the attacking force consisted of the Peruvian and Sylph sloops, and two transports, containing six hundred men, infantry and artillery, the latter under Lieutenant-Colonel Henry John. There were also eighty marines, and about as many seamen. The troops were landed on the night of the 2d of September, about five miles below the town. The American force is placed at fourteen hundred, which is probably an extravagant estimate, even including everybody at the scene of conflict; while it is far above the total of organized combatants, whether regulars or militia.

them. As daylight appeared the launches showed themselves above a point a little beyond gunshot distance below us. A rocket party was landed and threw four or five rockets, which though very well directed, did no further injury than by striking the ship's hull. A few discharges from one of our guns showed that they were beyond our reach. Shortly after, the enemy's bugles were heard in the direction of the militia, followed soon by three discharges of one of our guns, which had been taken to the road and placed in charge of Lieutenant Lewis.

The marines passed the word a few minutes after, from Lieutenant Watson, at the road, that the militia had broken and were in rapid retreat. As our own retreat would be effectually cut off if the enemy should reach the bridge before us, it became necessary to retire. This was done as soon as the guns were discharged and spiked, and fire communicated to the ship. The enemy's advance had reached the hill battery before all those at the wharf had left it, and the main body were so near the bridge that a part of our force, myself among the number, had to ford the creek, which the state of the tide fortunately permitted. The absence of necessary preparations before the enemy appeared, and the failure of the militia to make any resistance afterwards, left us no time to collect or preserve any of our personal effects, and the distribution of our small arms to the militia deprived us of all means of checking the pursuit of the enemy.

Our nearest naval station was at Portsmouth, New Hampshire. To this place our march was directed, over a newly marked road, from Bangor to Canaan on the Kennebec river, where there were a few farms newly opened, and thence by the ordinary route through a well settled country. The difficulty of finding subsistence for the whole number in a body led me to order them to separate, with directions for each to cross the country as he best could. In general, the few inhabitants willingly relieved our wants to the extent of their means; but, in one instance, where the ability seemed to be greater than usual, we met with a refusal of even the privilege of taking sufficient potatoes from a field to furnish a meal. When the last refusal was given, one of the seamen, who had heard all, stepped up to me and, touching his hat, quietly asked, "Shall we pull the house down"? a request that was, of course, refused, but which seemed to excite no small apprehension in our uncivil countryman. We proceeded to the next farm, where we arrived after dark, and found a cabin without floors or glass in the windows, tenanted by a young couple. To our request for food the

owner of the house replied that all his stock consisted of five sheep, but to them we were perfectly welcome. Three were accepted and soon prepared in the potash kettle which our host provided for the purpose. It was a pleasure to anticipate a future compensation by allowing him to select a musket, accoutrements and ammunition, which he had mentioned as very desirable to destroy beasts of prey, and to obtain game for food.

After reaching the Kennebec, funds were borrowed from the Bank of Waterville, and the inhabitants freely satisfied the wants of such of the men as were not within reach of this supply. The Navy Yard at Portsmouth had been designated as the place of rendezvous, and in the course of a few days the whole ship's company had reported themselves, excepting a few who had been detained on the road by sickness. Notwithstanding the facilities that offered themselves on such a march, and the general disposition of sailors to prefer a change, not a single desertion took place; a fact highly creditable to the men and affording strong evidence of their attachment to their officers. At Portsmouth the officers and crew reported to Commodore Hull and were assigned to duty there, till the further directions of the Department should be given. A court of inquiry was soon ordered, which fully exonerated the officers and crew for the loss of their ship, with some compliments on their general good conduct.

Thus terminated my first command. Not only had all our expectations of gaining reputation by an important success been disappointed, but our ship had been lost and a formal inquiry held to ascertain if censure or other punishment had not been deserved. Still the conciousness that neither the want of success against the enemy nor the eventual loss of the ship had been owing to negligence or fault on our part, supported by the official decision of the court and the continued confidence of the Department and of my brother officers, enabled me to preserve my cheerfulness and still to hope for better future success.

After collecting the officers and crew of the Adams at Portsmouth, and completing the arrangements for preserving the articles which had been secured from capture by removal before the enemy reached us, I was called to Boston by Commodore Bainbridge and employed at the Navy yard in forwarding the equipment of the ship-of-the-line Independence. These duties at the Navy yard were interrupted by an order to take command of the frigate Congress, which was lying in the Piscataqua, some miles above Portsmouth, and nearly dismantled. This order was gratifying to my feelings. The command of a larger ship

than that which I had been so recently obliged to abandon and destroy was a conclusive proof that the Department exonerated me from all blame and still considered me deserving of its confidence.

My new duties, however, required much of my personal attention. My old officers had all been transferred with me, with a few exceptions, and we were all anxious to have the shipr eady as soon as possible that we might try the chances of another cruise.

Not long after, peace was concluded with England.* A squadron was prepared to act against Algiers, whose Dey had declared war against us while we were contending against Great Britain.† Commodore Decatur, with a small force which could be soon prepared, was dispatched in advance of Commodore Bainbridge with other vessels. The Congress was to join this squadron, but was first to take out our Minister to Holland. It was June, 1815, before the ship was ready, when she went to Boston, and the Minister, Mr. Eustis, and his lady, embarked, together with Alexander Everett, secretary of legation, Mr. Eustis, a nephew of the Minister, and Colonel McRae and Major Thayer of the Engineers.

Our passage was pleasant, not only as regarded the weather but in the social relations with the passengers, a pleasure which is not always enjoyed in similar circumstances. The news of the return of Napoleon from Elba had reached us before we left the United States, and we had heard of his defeat at Waterloo before we reached Flushing in July.

With a small party of the officers I accompanied Mr. Eustis and his suite to Rotterdam and the Hague. The Engineer officers went to Paris. The journey to Rotterdam was made in a yacht which was offered by the government for the Minister. In navigating among the islands, inclosed by their dykes, there was very little of interest which came under our view, nor was there very much more on our return across the level surface which gave scarcely a variety to the prospect around us.

While lying at Flushing, the master of an American merchant brig called to inform me that a short time before a seaman had been taken from his vessel by the officers of a British sloop of war, in the river

* The news of the conclusion of peace arrived in New York, February 11, 1815, and the treaty was ratified February 17. Just before the arrival of the treaty, on the 1st of February, 1815, Captain Morris was married to Harriet Bowen, daughter of Dr. William Bowen, of Providence.

† The Act of Congress anthorizing hostilities against Algiers was approved March 2, 1815.

between Flushing and Antwerp. Notwithstanding this outrage at the very conclusion of a peace, the master had neither informed himself of the name of the commander of the vessel nor could he state whether the vessel had sailed from the river or not.

All that could be done was to direct him to collect accurate information on these points and submit the case to Mr. Eustis, to whom I also wrote respecting it. I had the pleasure to learn afterwards that the representations of our Minister produced the dismissal of the captain from his command. I believe this was the last attempt at impressment from an American by a British vessel, and any authorized attempt in the future would produce an immediate war, unless obviated by the amplest apologies.

The Congress met the Independence and some other vessels in the harbor of Carthagena on the 1st of August, but before our arrival Commodore Decatur had met with and captured the Algerine Admiral in a frigate, and destroyed some smaller vessels.* Subsequently, by his vigorous demonstrations, Decatur had been enabled to dictate the terms of a treaty, which, while it reëstablished peace and gave remuneration for all injuries to our own citizens, restored them and the captive subjects of Italy to their liberty.† Equal success had attended his demands on Tunis and Tripoli for payment of the value of prizes which they had allowed to be captured in their ports from American privateers by British vessels of war.‡ Commodore Decatur returned to the United States with the Guerrière. The other vessels joined Commodore Bainbridge, when the collected squadron showed itself successively before Algiers, Tunis, and Tripoli to confirm the impression which had been made by Decatur. After a short visit to Malaga and sufficient delay in Gibraltar to make arrangements for the distribution of the squadron, a few vessels were left under the command of

* The Algerine frigate Mazoura was captured June 17, by the squadron, and the brig Estedio, June 19, both off the coast of Spain.

† The treaty with Algiers was signed by the Dey June 30, 1815. It was drawn up by the American Commissioners, Shaler and Decatur, and agreed to by the Dey without alteration or delay.

‡ Two vessels had been captured in the harbor of Tunis by boats from the English brig Lyra, and two in the harbor of Tripoli by the Paulina. They were all prizes to the American privateer Abellino. Both governments promptly paid the amounts demanded by Decatur by way of indemnity; $46,000 in the case of Tunis, and $25,000 in that of Tripoli. *Ann. of Cong.* 1st *Sess.* 14*th Cong., pp.* 1765-1769.

Captain Shaw, and the remainder, fifteen in number, sailed together for the United States. Some attempts were made during the passage to maneuver as a squadron, but with very little success. Even in the simplest of orders, that of convoy in three columns, the respective vessels could rarely be brought into their proper stations, or kept there for an hour. Commodore Bainbridge led the center, and Commodore Jones the starboard column, and the third fell to my charge. It was very evident that none of our commanders were prepared to manage their vessels in a squadron which should be obliged to maneuver at all in presence of an enemy, and that such knowledge was not to be acquired except by practical exercises under an officer well acquainted with the theory of tactics and willing to devote much time and labor to their instruction.

The squadron separated before we reached our coast, some of the vessels proceeding to New York, and others, with the commodore, to Newport; and the Congress was among the latter. The small-pox made its appearance in the Congress five days after we left Gibraltar, upon a person who had not been on shore for some months. Means were immediately adopted which prevented, under Providence, any fatal results, though about seventy of the crew had the disease. All had so far recovered before our arrival that the authorities of Newport allowed a limited intercourse, which enabled me to visit Boston. The Independence, Congress, and Macedonian were soon after ordered to Boston, where we arrived in December, 1815. The crews were paid off, and the ships placed in ordinary, though the captains were continued in the nominal command of their vessels.

The following winter was passed in Boston. Early in April I was ordered to the command of the station at Newport, Rhode Island. A flotilla force had been kept here during the war, and the station was still recognized, though nearly all the force had been withdrawn. The duties were not sufficient to interfere with domestic pleasures, but seemed to relieve the tedium which would have resulted from entire idleness. These pleasures were, however, interrupted in June, by an order to the Congress to prepare for a cruise in the Pacific. This order removed us to Boston again, where my presence was required to superintend the equipment of the ship. The only vessel of our Navy which had visited the west coast of America was the Essex, during the late war, under Captain Porter. The government had several objects in view that they expected to accomplish by this cruise. The formal reception of the fort at the mouth of the Columbia river,

from the English authorities, was the most prominent, and at that time it was the intention of the government to occupy and arm it, for which I was informally directed to make preparations.* Another object, deemed of much importance, was to visit the different ports and harbors, and ascertain their resources and advantages for trade, and to collect all other information that might facilitate commercial intercourse between them and our countrymen. The presence in Boston of a gentleman who had resided some years on that coast for mercantile purposes, enabled me to obtain much information of places and influential persons, that might have been very useful. Attention was also to have been given to meteorology, and other similar subjects, in which interest had been expressed, and to which my attention was to have been called by a series of specific questions to be drawn up by gentlemen of science. Besides these a part of the cruise was to be devoted to the determination of several doubtful points in the geography and hydrography of the west coast, and of reported islands, reefs and shoals, in the adjacent seas. It was supposed also that some pecuniary advantages would accrue to me by participating in the safe keeping and transportation of the precious metals, which had hitherto been nearly monopolized by English vessels of war. A cruise for such purposes promised better chances for reputation than can often be expected in a time of peace, and afforded reasonable hopes of such compensations for another separation from home, as might mitigate, in some degree, the regrets and anxieties that could not be entirely removed.

All these consoling expectations were, however, destroyed, just as the ship was nearly prepared to commence the cruise. A collision had taken place in the gulf of Mexico between one of our small vessels of war and one of those belonging to Spain. The desire of our government to prevent a recurrence of this or any other difficulties which might interfere with the success of the pending negotiations for Florida, induced them to send the Congress, forthwith, to the Gulf of Mexico, as that ship could be soonest prepared. The squadron there was placed under my command, which was assumed in December 1816, and my presence in the gulf continued till July in the following year. With this change of our destination several other objects that were to have been assigned to our attention, were relinquished. Our own occupations were tedious and uninteresting, as our sole ob-

* This service was performed in August, 1818, by the Ontario, Captain James Biddle.

ject was to guard against any just cause of complaint being given by any of our citizens or by any others from our territory.

In the month of July I was ordered to proceed to Port au Prince, with despatches to our consular agent at that place, from the Department of State, thence with an agent to cape Henry,* and afterwards to visit the coast of Venezuela and collect and report all the information I could obtain of the condition of that country, the disposition of its inhabitants, and the probabilities of their making a successful resistance to the attempt then making to bring them again under subjection to the power of Spain. In addition to the singularly injudicious directions which required me to commence my visits to the leewardmost of the ports and then to contend against the constant trade winds, to reach the others in succession, it was recommended that I should pass between Yucatan and cape San Antonio, and pass up on the south side of Cuba.

As in duty bound an attempt was made to obey these orders, but after a week's trial the currents were found too strong to be overcome by the light winds that prevailed and the passage by the coast of Cuba was abandoned, and the ship allowed to follow the course of the current till she passed the Matanilla reefs. We then stood to the eastward with favorable winds, and, passing through the Caicos passage, arrived in a reasonable time at Port au Prince.

Upon inquiry it was found that our consul had left the place without appointing any person to act as his deputy, and that consequently there was no public agent entitled to receive the despatches from the Secretary of State. The agent who was on board, destined for cape Henry, had understood before he left Washington that the object of this despatch was to require explanations from Pétion, the president of the west part of the island, of certain acts of the government, or of its officers, some of which had injured the property of American citizens, and by one of which the life of an American had been taken, under color of law, but, as was alleged, without just cause.†

* Cape François or Haïtien.

† The island of Hayti or San Domingo had long been a bone of contention between France and Spain. In 1795 Spain gave up her claims, and the whole island came nominally into the possession of France ; but it was practically independent, under the administration of Toussaint l'Ouverture. In 1801 the French attempted to assert their supremacy, but after a few years of fighting, they were finally driven out by Dessalines, Toussaint's successor. Dessalines, after ruling as Emperor for two years, was assassinated in 1806, and the government was again

The particular circumstances connected with these cases were known to some of the citizens residing in the place. In this state of things the object of our visit would be entirely defeated, or I must assume the responsibility of opening the despatches from the Secretary of State to the Consul, and be guided by their directions. This was a very delicate and unpleasant responsibility, but one which; on reflection, was assumed as a matter of public duty. The letter recited the causes of complaint, and required explanations from the government, but these were not to be demanded till the ship should have sailed, that there might be no appearance of threats on our part. This forbade any official action on my part; but, having obtained an audience with Pétion, and having his secretary Inginac, as interpreter, the causes of complaint were referred to as having come to my knowledge in Port au Prince. It was urged upon his notice that these imputed acts of his government were calculated to produce much excitement in the United States, and might well be considered as evidences of unfriendly feeling on his part, unless they were satisfactorily explained; and that I had reason to believe that a despatch which had been sent by us to our consul there, from our government, had reference to these subjects. As the consul was absent I had thought it best to call his attention, unofficially, to them, and would be happy to receive and transmit to our government any explanations which he might feel disposed to give. He expressed his satisfaction at the opportunity thus afforded him to prove the justice of his own course, and his earnest desire to preserve the most friendly relations with our government. It was agreed that I should request the explanation in writing, which was done the next day, and a full answer returned by him on all the points on which complaint had been made.

Pétion was in color a light mulatto. He had received a good education, his manners were good, and he sustained his position with firmness and dignity. Inginac, the secretary, was also a mulatto, but

divided. Spain regained the eastern part of the island, calling it Santo Domingo. The blacks in the north chose Christophe for their president; while the mulattoes of the south and west, chiefly about Port au Prince, adhered to Pétion. Each of these leaders claimed to represent the government of Hayti, but the mulattoes were finally successful. Pétion died in 1818. He had passed some time in France and had served in the French army; and his administration was liberal and well conducted. His successor, Boyer, a somewhat abler man, united all Hayti in 1820, and two years later expelled the Spaniards from San Domingo. He governed the island successfully as "President of Hayti," for twenty years. In 1842, the republic was split up, and the two parts have since been independent.

of rather darker shade. He had also received a good English education, and had resided several years in Philadelphia, and was a man of no mean abilities. In the correspondence between himself and the commissioners sent from France, to reclaim their lost sovereignty or an indemnity, the letters of Inginac were in all respects equal to theirs. The former rich commerce of the place had dwindled to almost nothing; the population was greatly diminished, and the remaining inhabitants, with few exceptions, were very poor.

A few days beating against the trade winds carried us to cape François, or Henry, the commercial capital of the Emperor Henry, or Christophe, the other chief who ruled over the central portion of the island, where the blacks predominated. Mr. Tyler had been sent with us, to reside here, ostensibly as agent for distressed seamen, but really to endeavor to recover from Henry some hundred and twenty thousand dollars, the value of property belonging to merchants in Baltimore, which he had seized, to compensate him for losses sustained in some commercial operations with others in the United States. Our government had always avoided any formal or implied recognition of this government, and consequently Mr. Tyler's instructions directed him to reside in the city of St. François, in that part of the island of San Domingo under the command of General Christophe.*

When these instructions were communicated to Christophe, who was then in the country, he directed Mr. Tyler to be informed that he felt complimented by having been informed of his proposed residence and its object, and should be happy if he could render him any service; but he could offer nothing specifically, because he knew nothing of an island called San Domingo, nor of General Christophe. In reply to a remark made to his secretary, who brought his message, that this apparent misdirection and misnomer might have occurred through the inadvertence of a clerk, he observed that the example given by General Washington, during our revolution, under circumstances somewhat similar, was too good not to be respected and followed by him. The real object of Mr. Tyler's visit appeared to be

* Christophe was appointed president for life, by the assembly of blacks at Cape Haitien, in 1806. He had served as a Brigadier-General under Toussaint at the time of the French invasion, and, later, as general-in-chief under Dessalines. In 1811 he assumed the name and title of King Henri I. His rule was severe and despotic, and towards the end of his life he found himself deserted by his subjects, who gradually went over to Boyer, the successor of Pétion. Christophe killed himself in October, 1820, out of mortification at the success of his rival.

suspected or known, and it was very distinctly intimated that the object could be secured without difficulty by an agent accredited to the Emperor.

In the meantime every civility was tendered to us. The carriages and horses of the Emperor were placed at the disposal of the officers, with permission to visit the surrounding country at pleasure ; and fresh provisions, vegetables, and fruits were offered gratuitously for the ship's company.

An official visit was made by me to the Governor, the Duke of Marmalade. I was met at the head of the staircase by an elderly black man, well but plainly dressed, whom I mistook for some principal servant, until he announced himself as the Governor, and showed me to his reception room. He seemed to be a man of sound understanding, without pretension or parade, easy and quiet in manner, and tolerably intelligent. The furniture was good but plain, and in good taste, and such was the character and style of the refreshments which were offered. Our interpreter was the Emperor's secretary, the Count of Limonade, who had resided several years in the United States. These apparently laughable titles of Marmalade and Limonade were derived from the names of villages and estates, from which the titulars derived certain revenues as well as their titles.

The authority of the Emperor was thoroughly despotic. A *Code Henri* had, however, been established, comprising laws which were in general administered with firmness. He had also introduced schools for the English language. It was stated as a favorite object with him that this should supersede the French, as one means of weakening the influence and power of France for recovering authority in the island. He also required all the inhabitants of the country to devote the labor of a certain number of days in each week to cultivation. Taxes could be paid or required in the proceeds of such labor, and the articles thus paid were sold by his officers, and the proceeds used for public purposes. His stronghold was near the summit of a mountain, ten or twelve miles from the city, the passes to which were difficult of access and could be easily defended. In this stronghold, according to report, were deposited some millions of dollars in specie, and large quantities of gunpowder and flour, carefully secured from injury in demijohns, and buried, to meet and supply the wants of a siege. There were at that time some apprehensions of invasion by the French, and the Emperor's plan to meet it was to withdraw behind the first barrier of mountains, defend the passes and leave the French to occupy the coast only,

until the diseases of the climate and the absence of all commercial products should induce them to withdraw. A revolt, some years later, put an end to his life and plans, and distributed his accumulated wealth, of which the sable Empress and princesses were allowed to take a large sum with them to Italy, where they resided with considerable display for some years.

As Mr. Tyler could not be received in his official character, he remained on board, and after a contest with a head wind and adverse current for three weeks, we anchored off Pampatar, in the island of Margarita, to begin our inquiries respecting Venezuela. Morillo, with his Spanish troops, had left the island only three days before our arrival, after an attempt to subdue it.* The effects of some severe conflicts were but too visible. The capital village, where we found the Governor, had been burned, and the breakfast of which we partook was given us in a roofless building without other furniture than some loose boards for a table. Some idea may be formed of the ferocious spirit engendered by this civil war from the facts stated by the Governor, who was asked if he had not included the whole population in what appeared to be an exaggerated statement of the military force of the island. He acknowledged that he had done so, and, when it was intimated that women and children could not be thus employed, he answered that they could be employed as they had recently been, in killing all those who were left wounded on the field.

From Pampatar we proceeded to Cumana, which we found occupied by the troops under Morillo. I paid him the usual visit of ceremony in such cases, which he returned quite unexpectedly before 7 o'clock the following morning. In reply to inquiries for fresh provisions, vegetables and fruit we were informed that there was probably not a single bullock within eighty leagues of the place. No vegetables could be obtained, and the only fruits that could be purchased were a few unripe limes. Water was readily obtained from the river, but it was soon found unfit for use, in consequence of numerous small insects or fish which it contained.

Barcelona received our next visit. It was several miles from the shore, and I reached it by ascending the river in one of our boats. The city was well built but seemed nearly deserted. Four human heads, exposed on pikes upon the bridge over the stream which pass-

* Pablo Morillo, Count of Carthagena, lieutenant-general in the Spanish army, first made his reputation in the Peninsular war, and he met with some success in the early part of the Venezuelan struggle. He returned to Spain in 1820.

ed through the city, marked the punishment of some unsuccessful revolt. The Governor received me with much civility, and invited me to partake of his late breakfast. This was far from profuse—three very small rolls of bread and as many eggs, which he had recently received, with others, as a present from friends in America; a fact that diminished any merit in forbearing to partake of them. A captain in the Spanish service, but a Scotchman by birth, acted as interpreter, and as a guide through the city. He afterwards accompanied me on board, and remained till the next day. From his statements the situation of the surrounding country was most deplorable, owing to the unsparing destruction and devastation caused by both the contending parties. Food was so scarce in the city that he and other officers were dependent on the return furnished for the army. Nothing could be procured by force or money. In their contests no quarter was given on either side, and the parties who were sent to sweep the country were ordered to burn every house, destroy all cultivation and every useful animal, kill all adult men, and bring the women and children in as prisoners. He had himself been employed under similar orders more than once. Retaliation was the excuse assigned by both parties for their atrocities.

We next anchored off La Guayra, to which place Morillo had preceded us, with his troops, a few days before, for the purpose of passing to the south, to meet a threatened attack from the patriots in that quarter. During a dinner to which he invited me he conversed without reserve upon the existing struggle in which he was engaged, stating freely how much his original force had been diminished, and the probable time when he should be obliged to retire, unless Spain should send him reinforcements. As he, like all others, deprecated the character of their warfare, in his conversations with me, I inquired if it could not be terminated by a mutual agreement between him and the patriot chiefs to conform to the milder usages of war between civilized nations. He informed me that this had been attempted in vain, because the authority of the patriot chiefs was disregarded by detached parties; which left no other course than the miseries and barbarities of reciprocal destruction.

After gathering all the information that could be obtained from the officers of the army, and the citizens of La Guayra, and Caracas, to which place I made a visit of a few days, I repaired to Hampton roads to await the further orders of the Department, and to forward reports of my proceedings after leaving the gulf of Mexico. These

met the approbation of the government, and relieved me from any further anxiety respecting the responsibility assumed at Port au Prince. The opinions given in my report to the Secretary of State, respecting the issue of the contest in Venezuela, the period when the contest with Spain would cease, and the probable consequences of newly acquired independence upon the patriot leaders, have since been proved more correct than might have been expected from such limited means for observation and gaining information. The government afterwards caused my report to be published unofficially in the *National Intelligencer*, from which I inferred that it was satisfactory.

My health had been much impaired during the cruise, and, as the ship was now destined for a very long cruise, I was relieved at my request from the command, and transferred to Boston, with the nominal command of the frigate Java, lying dismantled at that place. My principal public employment was upon court-martial duties, of which I had enough to make me quite familiar with the form of proceeding and the laws which regulated it.

Early in May, 1818, I was ordered to the Navy yard and station near Portsmouth, New Hampshire, and immediately assumed the command. The construction of a ship-of-the-line was directed to be begun soon after, the general superintendence of which, with the other usual duties, gave me useful and agreeable employment, with a prospect of its continuance for some years.

In the month of August, however, a violent cold produced pneumonia, which suddenly became so dangerous that an immediate change to a less exposed residence was advised, and with some difficulty I reached Roxbury with our family. By judicious treatment, great care and ever-watchful kindness, my strength was sufficiently re-established by October to enable me to adopt the advice of my physicians and begin a journey towards our southern border. I first placed my family in a house hired in the town of Portsmouth. Passing through Washington orders were given me to form one of a court of inquiry which was to be held at St. Mary's, Georgia. I arrived there about the 1st of January, 1819, having gained much flesh and strength during the journey. Unexpected delay in the attendance of witnesses retained us at this place until early in May. A part of my leisure was agreeably passed in visits to Mrs. Shaw, the daughter of General N. Greene, at her residence on Cumberland Island; to the garrison at Fernandina, with General Greene, Colonel Clerick, and other officers of the Army, and to the plantation of General McIntosh, on the river Satilla.

My return was by the way of Savannah and Charleston. At the latter place I found President Monroe, as the guest of the city, while stopping for a few days on his tour through the southern states. The arrangements of the city on this occasion were worthy of the well established reputation of its citizens for generous hospitality, and their feelings were gratified by the spirit in which their attentions were appreciated by the President, in collecting at a large dinner such of his revolutionary companions as could be found, with the distinguished citizens of the day.

In June I was again at my station at the Navy Yard in Portsmouth with my family. My health was much improved, though a troublesome cough continued for several years, which required watchfulness and careful attention to diet and exercise.

The renewed expectation of a continuance with my family for some years was again disappointed in September by an unexpected order to proceed with a small squadron to Buenos Ayres, for the purpose of completing duties which had been interrupted by the recent death of Commodore O. H. Perry. The ships (Constellation and John Adams) were then nearly ready at Norfolk, and my presence there was required so soon that time was not permitted to see my family removed.

When I reached Washington, on my way to Norfolk, instructions from the Department of State were handed to me, from which I learned that the object of the government was to make known to that of Buenos Ayres, the friendly disposition of the United States, and inform it of certain acts of our government, by which that friendly disposition had been manifested, much to their advantage, by our diplomatic communications and acts in Europe.

It was deemed expedient that I should also receive the personal directions of the President, that I might be more fully informed of his views upon some subjects than could be gathered from the written instructions. He was at his residence in Loudon County, Virginia, where I passed a day with him and received his final directions.

After exchanging civilities with the French officers under Admiral Duperré, whose flag was flying on a frigate at Norfolk, and completing the stores of the ships, we sailed from Hampton roads and, keeping company, arrived off Monte Video, in the LaPlata river. Here we found the U. S. Schooner Nonsuch, Lieutenant Turner, waiting our arrival. A small Portuguese squadron, under Vice Admiral Lobos, was anchored off the city, with whom the courtesies of salute and visits were exchanged.

The Constellation required a greater depth of water than the river afforded to Buenos Ayres, and the John Adams, Captain Wadsworth, was taken to convey me to that city. The navigation of the river was then very little known, and though the Portuguese admiral had loaned us his pilot, who was considered the most skilful, the ship grounded when about fifty miles from Monte Video, and it was not without great exertions for twenty-four hours, much danger, and considerable injury, that she was got afloat again.

When we reached the city, I took up my residence on shore, where I met Mr. Prevost, a private agent of our government, with whom I was directed to consult, in case he should have arrived at Buenos Ayres from Chile. A visit of ceremony was paid the next day to the Supreme Director, Puerreydon, and a day fixed for an official meeting. Before this day arrived one of those sudden revolutions occurred which have been so common in the South American republics. Puerreydon fled to the opposite side of the river, a new Supreme Director, General Rondeau, was elected by the Junta, and a substitute appointed to act in his stead, till he should arrive from the army then at some distance in the interior. When the little commotion that attended this change had subsided an interview was had with the Substitute Directors and, a few days after, another with Rondeau. These officers appeared to be well satisfied and much pleased with the friendship of the United States, as it had been exhibited by all their public acts and by their special assurances. They also gave instructions for complying with some requests that were made for the means of distinguishing armed vessels, duly authorized and commissioned by their government, from others which, there was reason to believe, had forged their papers and cruised in other and distant seas.

The newly appointed officers were soon removed from all power by another and more important revolution, by which the former authority given to the Supreme Director to conduct the exterior relations of the different provinces, under or with the assent of a congress representing the whole, was revoked, the congress dissolved, and the authority of the province of Buenos Ayres limited to its own particular affairs.

Don Manuel Sarratea was elected governor under this new state of things. Some personal acquaintance with him satisfied me that he was not qualified to control the discordant and restless population of the province, divided and agitated by acts of different individuals each of whom was anxious to obtain possession of power to the exclusion of others. Under such circumstances any longer stay seemed

to promise no advantages sufficient to justify our detention, and, after an official communication to the governor of the general objects of our visit, Mr. Prevost was left to do more if proper occasion should offer, and I returned to Monte Video and sailed soon after for the United States.

A commission from the United States had previously visited Buenos Ayres and had presented in a report their opinion of the condition of the country, the disposition of the inhabitants, and their chances for the establishment of a well-organized and efficient government. This report had presented a much more favorable opinion of the political state of the country, and of a general interest in the affairs of the government by the people, than I could find any sufficient reason to concur in.*

It seemed almost presumptuous to place my opinion in opposition to theirs, when they had enjoyed better opportunities, and for a longer time, than myself, and upon subjects with which they were much more familiar from their previous employments. Meeting this hazard, however, my report embraced the general information which I had obtained of recent and passing political events, with the sources from which it was derived; and it expressed opinions of what might be expected for the immediate future, with the reasons on which they were founded. Subsequent events have shown that my anticipations were tolerably correct, though they were considered unsound at the time by the more ardent friends of the South American people.

On our way to the United States we stopped for a day at St. Pierre, Martinique, and for two or three days at St. Thomas. At the latter port we found the French Rear Admiral Duperré, whom we had left in Hampton roads; and a question of etiquette arose between us. He considered the first visit his due, in consequence of his superior nominal rank, which I was unwilling to admit, because, as a stranger in a neutral port, and, equally with himself, the commander-in-chief of a squadron, usual courtesy required the first visit from him. The force under my command was greater than his, and the extent of my station was not probably exceeded, as it embraced the North and South Atlantic oceans. The question was also complicated by the number of guns which should be given and received as salutes. The consequence was that no visits were interchanged, he being restricted by positive instruc-

* The members of the Commission were C. A. Rodney, John Graham and Theodoric Bland.

tions, and I claiming that the authority given to officers by their country, and not their official designation, which each nation had a right to fix for itself, ought to regulate official precedence between officers of different nations. The governor of St. Thomas received our ship and myself with exactly the same honors which had been previously given to the ship and person of the French admiral.

The ship returned to Hampton roads. After a visit to Washington, and thence to the President's residence, in Albemarle, at the suggestion of the Secretary of State, I rejoined the ship and was soon ordered to reassume my former command at the navy yard in Portsmouth, which I reached in May, 1820.

Information of the death of Commodore Decatur, in a duel with Commodore Barron, was received from the pilot, on our arrival. Besides the regret occasioned by the loss of a brave officer who had contributed so much to the honor of the Navy and the country, and with whom I had long been intimate, my feelings were specially interested from a more particular cause.

When I was in Washington, on my way to join the ship for my late cruise, Commodore Decatur detained me at the commissioners' office till the other gentlemen had left it for the day, and showed me a letter which he had received from Commodore Barron, and requested me to act as his friend should it become necessary to meet Commodore Barron. This letter, in substance, called on him to state whether an alleged observation of his at a dinner table, that "if Commodore Barron chose to challenge him he would accept it," was intended as an invitation for a challenge or not. Decatur admitted that an expression of the kind had been used by him, but under circumstances which rendered it inoffensive if not rather favorable to Commodore Barron. The conversation had turned on the conduct of Commodore Barron, when the Chesapeake was attacked by the Leopard in 1807, and in remaining out of the country during all the subsequent war with Great Britain. Very unfavorable opinions were expressed by some, and, among them, one that he had forfeited all claim to consideration or notice from the officers of the Navy. Decatur dissented from this on the ground that so long as he was recognized as an officer by the government he was entitled to consideration as such from others. The question was then put to Decatur, "If Commodore Barron were to challenge you, would you consent to meet him?" To which he replied that he would, so long as he was considered by the government worthy to hold his commission in the Navy.

Although the necessity for an immediate obedience to orders placed it out of my power to comply with Commodore Decatur's request, if any delay was necessary, my opinion was given at once that a simple statement of the facts, given as an answer to Commodore Barron's letter, would effectually prevent any further proceedings. This he declined, because it might have the *appearance*, to some, of too earnest a wish on his part to avoid meeting Commodore Barron. The unreasonableness of this objection was urged, since his courage was established beyond all question, and his whole course in life placed him above any suspicion of the fear of consequences; that, so far from being injurious to his reputation, such a statement of facts would elevate it still higher, and that the improvement of so favorable an opportunity for setting a good example to the younger officers of the Navy was required from him by the highest considerations. A short answer was drawn up, embracing the facts as he had stated them; but notwithstanding all that could be urged, and his constant assertions that he had no desire to fight Commodore Barron, and that he could gain nothing and might lose his life by it, still all could not induce him to sign a statement which he admitted to be correct and which would probably remove all cause for any further action. He appeared to be governed by an apprehension that his reputation might suffer if he took *any* means to avoid a meeting with Commodore Barron, if Barron had any disposition to bring about one. Our conversation was continued till dark, and the most I could obtain from him was a promise not to answer the letter for three days, he having refused to wait for the advice of the person whom he might select to act as his friend if a challenge should be sent to him. The whole of the correspondence has been placed before the public and has left a general impression that the challenge was forced from Commodore Barron by the last letter from Commodore Decatur, though few are aware how easily and with what propriety on the part of Commodore Decatur it might have been prevented.*

* The following anecdote, related by Loyall Farragut, Esq., may not be without interest in this connection. Mr. Farragut says:

"My father, you know, was a great admirer of Commodore Morris, and has alluded to him in his journal as 'the ablest sea officer of his day.' Farragut was serving at the Norfolk Navy yard not long before the Mexican war, and at the time a court martial was in session composed of many of his old shipmates, among them Commodore Charles Morris. Commodore Barron was in Norfolk at the time, and Farragut was suddenly inspired with the idea of bringing these two men together, be-

My time was occupied, at Portsmouth, with the usual duties at Navy yards, and upon courts-martial, on different occasions, till the 3d of March, 1823, when I was appointed a Navy Commissioner, a situation which had been indirectly offered and declined when I returned in 1820.

Leaving the family at Portsmouth, I repaired to Washington, and entered on my duties, with Commodores Rodgers and Chauncey as my associates, Smith Thompson being Secretary of the Navy, and J. K. Paulding Secretary of the Board. The usual annual visit of the Board to the different Navy yards was made this year in July and August, on the completion of which it was arranged that I should remain at Portsmouth till it would be safe and convenient to remove the family, and in the meantime prepare a revison of the general regulations of the service, for the consideration of the Board and the Department.

This duty was performed and the family removed to the district in October. Mr. Southard succeeded Mr. Thompson as Secretary of the Navy, in the following December, and Commodores Bainbridge and Jacob Jones succeeded Commodores Rodgers and Chauncey on the 15th of December, 1824. Mr. C. W. Goldsborough had previously succeeded Mr. Paulding.

The duties of the Board of Navy Commissioners, as defined by the law that created it, embraced everything of a ministerial character, but they were to be performed under the superintendence of the Secretary of the Navy, to whose office the Board was attached. Through the inefficiency and indolence of the Secretary, at the time when it was first established, in 1816, the actual duties of the office, excepting those connected with the Cabinet, had for some time been devolved almost entirely on the chief clerk.* The Board appears to have been

tween whom there had existed a bitter feud for many years, arising out of the Decatur duel. They were both friends of Farragut, and the idea of being the medium of settling the difficulty filled his heart with enthusiasm. He went to Morris in his open, frank way, and asked him if he would meet Commodore Barron at his [Farragut's] table. It was not difficult to read in the face of Farragut the sentiment that inspired him, and Morris generously said he would be happy to meet Barron. Farragut had an interview with Barron also, and the result was that these old naval officers who had been bitter enemies for forty years were reconciled. Farragut could not conceal his gratification at the result of the affair."

* John Quincy Adams says in his diary, under date of March 25, 1819, "Mr. Thompson, the Secretary of the Navy, left the city this morning for a visit to New York. This office sits easy upon its holders. Mr. Crowninshield used to re-

disposed to reject the authority of the chief clerk, when acting for the Secretary of the Navy, and it became necessary for the President to interfere by a decision in which he very properly sustained the head of the Department.

The Navy had hitherto been without system, or any attempt to introduce any into any branch of the service, excepting the tables of dimensions and allowances prepared by Commodore Bainbridge and myself in 1813. The operations of the war which had just been concluded, had left even greater confusion than usual, and there was a wide field open for the useful action of the Board. In their anxiety for the immediate correction of some of the existing evils the Board at once entered into an extensive correspondence, which involved them in so many details that they had never found time to frame a proper system for the regulation of their own proceedings, for regularly collecting and rendering available information which would be very desirable and frequently necessary for judicious action, nor even for a convenient distribution of duties among themselves. When I joined the Board these evils were obvious, but had become almost irremediable from the mass of current business which required daily attention, and occupied all the time of the Board. Much of a very useful character had however been accomplished. General regulations had been prepared, approved, and issued. Measures had been taken for carrying into effect the law for the gradual increase of the Navy by collecting timber, iron, copper, etc., and by beginning the construction of several ships-of-the-line and frigates. The general system of procuring supplies by contract had been adopted, and many valuable checks had been introduced against frauds and the misappropriation of public money by disbursing agents and contractors, most of which have been subsequently incorporated into laws by Congress, and made applicable to all the Departments.

As each member of the Board was responsible equally for all its acts, it became the duty of each to be sufficiently informed on each particular subject of action to enable him to give a satisfactory vote upon it. Some members might be willing to act on the information which others had collected and furnished in the consultations, while

main at Washington only when Congress was in session, and spent the remainder of his time at home. Mr. Thompson appears determined to follow the example. The chief clerk and the Navy Commissioners make the duties of that department comparatively very light."

others preferred the labor which would enable them to act more independently. With my own views of duty this latter course seemed the proper one, and it was my endeavor always to act upon it. Though very laborious it proved advantageous, as it soon made me and then kept me thoroughly informed of *all* the business of the office, and furnished unexceptionable means for obtaining and preserving a fair share of influence in the decisions of the Board, upon the very varied and numerous subjects that came before it.

Mr. S. L. Southard succeeded Mr. Thompson as Secretary of the Navy, in December, 1823. In the summer of 1824 the Secretary and the Board of Navy Commissioners made an official visit to Erie, Sackett's Harbor, and Whitehall, at which places the vessels on lakes Erie, Ontario, and Champlain had been collected and left, after the peace of 1815. The vessels were found to be much decayed, many of them sunk in shallow water, and the perishable articles of stores no longer of much value. The journey was extended down the St. Lawrence to Montreal and from Whitehall to Portsmouth, New Hampshire, and thence to Boston and New York and Philadelphia, on our return towards Washington.

The sale of all the vessels and perishable stores was recommended, excepting the ships-of-the-line, which had been begun and were still on the stocks, at and near Sackett's Harbor. This was soon after authorized and carried into effect and the ordnance sent to the Navy yard at New York. The further employment of officers on the lake stations was discontinued. Recommendations were made by the Board for an extension of the Navy yards at New York and Norfolk, and it was advised that plans for the future improvement of all the yards should be proposed and approved, after which no deviations from them should be permitted, without the executive sanction. Information was collected and reported to Congress, and published by their order, in order to desseminate knowledge in regard to water-rotting hemp and flax, in the hope of rendering ourselves independent of the foreign articles. The form and arrangement of the annual estimates were changed so as to show separately the expense of the shore establishments, and of the ships and active force of the Navy. This arrangement diminished the heads of appropriation and still exhibited the expenditures fully and clearly. By much exertion the Board succeeded in preventing any further advances to contractors, which had hitherto been done, in a few cases, by the order of the Executive, from some of which danger of loss had occurred.

When it was determined to return La Fayette to France in a public ship the President thought proper to select me for the command. It was his desire that I should perform this duty without resigning my situation as a Navy Commissioner, to which, in his opinion, there was no legal objection. The designation for this duty, under the circumstances of the time, could not be otherwise than flattering to me, and was accepted with pleasure. I believed, however, that the exercise of the military duties of a captain, whilst holding a district commission of a civil character, would be exceedingly disagreeable to the feelings of the officers, even if legal. This belief was made known to the President and it was stated that I should feel bound to resign the commissionership, as soon as orders should be given to command the ship, to which he made no further objection.*

The Brandywine had been named, launched and equipped for this special service, the officers had been selected, so that there should be at least one from each state, and, when practicable, descendents of persons distinguished in the Revolution. The preparations were made by the first lieutenant and the officers of the yard, and I only took command on the first of September, two days before the general, his son, and his suite embarked at the mouth of the Potomac. He was accompanied by the Secretary of the Navy, and many other public officers from Washington, and met by a large party from Baltimore. A collation was prepared on board for our numerous guests, at which many speeches appropriate to the occasion were made, and the parting wishes of the general and guests were reciprocated. The next morning we stood down the bay, and to sea with a favorable wind. A few hours after the pilot had left us, it was found that the ship was leaking rapidly. This was not more unexpected than unpleasant. To take the general back to any of our ports after he had taken a formal leave of the country would place every one in an awkward position, but to expose him and others to any serious hazard by continuing our

* The following entry appears in the diary of President J. Q. Adams, under date of July 9, 1825; "Southard, S. N., again with Captain Morris, who is willing to command the frigate to take General La Fayette to France, and there give the ship to the next officer, to proceed with her to the Mediterranean, to be there commanded by Captain Patterson. But Morris thinks he ought to resign his seat at the Navy Board, and he wishes to have a term of six months allowed him to visit the naval establishments of France and England and to witness the latest improvements in naval architecture. I advised him at all events to go, and said we would consider further with regard to his resignation."

course was a serious responsibility. It was impossible at the moment to ascertain the precise cause of the leak, but from some experiments it was evidently effected by the greater or less velocity of the ship's motion. As it was under control by the pumps it was determined to proceed, especially as La Fayette was unwilling to return except from actual necessity. It soon became evident that the leak was caused by the oakum working out of the seams of the ship's sides. The weather and sea, for nearly the whole passage, caused the ship to roll so deep, that it was exceedingly difficult to apply any remedy, but as the planks gradually swelled from immersion, the leak gradually diminished.

Our passage was from these and other causes rendered very uncomfortable, and it was only on two days that the general was able to join us at dinner, or to visit the deck. In the early part of the passage he suffered from sea-sickness, and the gout affected him considerably afterwards. This was much regretted, for, besides the discomforts, we were deprived of most of the pleasure which had been anticipated from the society of the general, and the hope of listening to his reminiscences of some of the interesting scenes and persons connected with his eventful life. My own health, which had never been perfectly restored since 1818, had become seriously impaired by a chronic affection of the liver, and consequent irritability of the stomach, which rendered me unable to do much towards the entertainment of our guest,or to become acquainted with the officers. We arrived off Havre in October, and, upon communicating with our consul, found that no objection existed to the landing of La Fayette. This had been supposed possible, as it was known that he was even more obnoxious to the Bourbon than to the Imperial government. The éclat of his reception and treatment in the United States, it was thought, might render the government unwilling to receive him again, lest his influence should excite movements dangerous to the monarchy. Should such have been the case, and permission for him to land have been refused, I was authorized to use the ship to convey him to any other part of the world that he might select.

The morning after our arrival, the wife and children of George La Fayette, M. Lasteyrie, the son-in-law of La Fayette, and his children, came on board to meet the general and his son, and, after passing a few hours, they all returned together to the shore. Before leaving the ship the general was requested to ask for anything he might desire to take with him, when he requested the flag of the ship, under which he was received on board, and which he was about to leave. To this he sub-

sequently added a few articles, that he might give an *American* dinner to the inmates of La Grange. He left the ship under a major-general's salute, and three hearty cheers from the ship's company. As the object of my command was merely to see the general to France, the command was relinquished to the first lieutenant, and I accompanied La Fayette to the shore, and for a short time became his guest, as he had been mine. Captain Read, of the Navy, who was a passenger in the ship, was also of the party.

The party dined that day with a liberal deputy to the Chambers from the city, and on the following morning partook of a déjeuner, with a large party, at the residence of the United States consul, on the heights above the town. About noon the family of General La Fayette, Captain Read, and myself, left the city for Paris, and on passing the gates we found a large party, in carriages and on horseback, who had assembled to compliment La Fayette, by escorting him for some distance on his way. At the end of a league, the escort halted, and the gentlemen composing it dismounted, as did La Fayette and his suite. An address was made in behalf of the citizens, to which he responded in his usual felicitous manner, and the parties separated after the general's carriage had been nearly filled with bouquets of flowers and immortelles, by the ladies who had joined the cavalcade in carriages.

A late dinner was taken in a small village on the way to Rouen, at which the landlord contrived a compliment to La Fayette. The dessert-plates had upon them representations of scenes in our revolutionary struggle, and he placed for the general that having for its subject the storming of the English redouts at Yorktown. The next day was passed at Rouen, where another deputy of the liberal party assembled a number of the political friends of La Fayette to meet him. Though all proper precautions were taken to avoid producing any public excitement, the street near the house where we dined was thronged with people during the evening, who at last began to cheer La Fayette, as a call for his presence in the balcony. This was delayed for some time, but finally acceded to for the purpose of thanking them and recommending their immediate separation to prevent any excuse for the interference of the police. The effect, however, was unfavorable. The cheers increased, and the mounted police, who had been prepared, and stationed near, moved down the street in a body, and compelled all to retire before them. A few persons were injured, and much excitement created, but with no other consequences. The party separated immediately as all pleasure had been destroyed.

At Saint Germain we separated. George La Fayette went to Paris, with Captain Read and myself, and the general and his family proceeded directly to La Grange, at which place we joined him about a week later.

The residence of La Fayette was a part of the estates which formerly belonged to the family of Madame La Fayette, and contains about seven hundred acres. The dwelling is an ancient structure, forming three sides of a square, with a round tower at each corner, of which about one half projects beyond the sides of the building. Although one side is open, and the entrance to the dwelling is on the inner side of one of the wings, the passage to the entrance is through the side opposite to it, and would lead to the supposition that the building formerly had all its sides closed. The walls of the building were five or six feet thick, and its whole appearance and character plain and strong, without any attempt at ornament.

The family and guests numbered about twenty-five while we were there. They assembled at breakfast at about ten, at which nearly an hour passed. They then separated, each making such arrangements as might be most agreeable till dinner, which was served at five. About an hour was passed at table, from which all went to the drawing-room, and passed the evening in conversation. At ten tea was served, after which the guests retired at pleasure, and by eleven the rooms were vacant. At the request of La Fayette, I sat to Scheffer for a portrait, of which a copy was also made by him, and sent by the general to my wife. The likeness was completed at a single sitting of about four hours.*

* The heliotype which appears as the frontispiece of this book is from the original portrait by Ary Scheffer, presented by La Fayette to Mrs. Morris. The following passage, which occurs in a letter of La Fayette, found among the Morris papers, may be of interest in this connection.

La Grange, January 1, 1827.

"I hope, my dear friend, your portrait sent so long ago is at last arrived at its destination. The copy at La Grange has been in the hands of Scheffer to give it that share of color and counterpoint which you had brought from your coasting journey, so as to become similar to that in possession of Mrs. Morris. It faces the Brandywine flag.

* * * * * *

Let me hear from you, my dear Commodore, and believe me forever your affectionate obliged friend,

LA FAYETTE.

After a visit of three days, which was rendered very agreeable by the kindness of the family and the society of other interesting persons, we returned to Paris.

My instructions required me, after having seen La Fayette safely landed, to visit the dockyards of France and England, for the purpose of collecting any information that might be deemed useful, in forming plans for the permanent improvement of our Navy yards, or for any other branch of the naval establishment.

A few weeks were spent in Paris, visiting some of the many objects of interest which are collected there, and in forming acquaintances with, and obtaining information from, some of the officers connected with the central administration of the Navy.

Captain Read proposed to accompany me in my visits to the French ports, and we left Paris for Brest, on the 4th of November. I passed by Cherbourg, because I had already seen it in 1812, as well as an admirable plan of it, in relief, at Paris, and because the time allotted me by the Department required a very rapid examination. A fortnight at Brest, five days at Lorient and as many at Rochefort, made me tolerably well acquainted with the various establishments which they contained, their relative position and extent, their mode of obtaining and preserving materials and stores, some notion of their supplies and the source from which they were derived, the condition of their vessels, and the cost of the different classes of ships of war.

Mr. Brown, our Minister, had obtained the sanction of the Minister of Marine to our visit, and every facility was offered by the officers to our public object, and attentions to ourselves personally, except at Rochefort, where the commanding officer limited himself to an obedience of his orders in relation to us.

From Rochefort, we proceeded to Bordeaux, where we passed two days. We then crossed to Narbonne, on the Mediterranean, after stopping one day at Toulouse; thence, by the way of Montpellier, Nîmes, Avignon and Marseille, to Toulon. We here spent a fortnight in visiting the dockyard and its dependencies, and every facility was afforded for the collection of the information we desired.

On our return to Marseille Capt. Read left me, to find his way to Mahon, where he was to take command of one of the ships of our squadron, and, staying only one day to look at this city, I proceeded by the way of Lyons to Paris, which I reached in December. My attention here was devoted to obtaining further information from the officers connected with the central administration of the Navy, and to the

society of our Minister and of La Fayette, and the circles to which they had the kindness to introduce me.

Early in January I proceeded to London by the way of Calais and Dover. Our Minister, Mr. Rufus King, readily obtained permission for me to visit the English dockyards. Before commencing the examination I visited some of the many interesting objects in and near London.

Capt. Basil Hall had called upon me, and with him I visited Mr. Rennie, under whose direction the new London bridge was then building; and who, after showing his plans for it, accompanied us to the mint, the West India docks, and the Thames tunnel, of which the horizontal shaft had just been begun. Mr. Brunel descended with us, and explained the plan, and showed us the means adopted to guard against accidents, when making the necessary excavations. The apparent danger of excavating a tunnel under the Thames rendered it difficult for him to find workmen willing to engage in it, even among the Cornish miners. His own confidence of success appeared to be perfect. A day was given to Greenwich hospital and its schools, and to the observatory, and an evening each to the Royal and the Geological Society, and to the House of Commons. At the first there was little of interest. Dr. Buckland read an interesting paper on the fossil bones found in England, at the second, and at the House of Commons there was an interesting debate, in which Messrs Ellis, Robinson and Huskisson were engaged, and Mr. Canning made a few remarks, and a member was coughed and "shuffled" down. A short visit was also made to Harwich, to see a railway for hauling up vessels, but there was nothing in their processes superior to what was already used in the United States.

Three or four days were devoted to each of the dockyards, at Deptford, Chatham, and Sheerness. The first is the great provision-depot, and was interesting from the variety and extent of its arrangements for preparing and preserving different kinds of provisions and stores. Chatham is remarkable for its convenient arrangements rather than for its extent. Sheerness had been recently enlarged, and its arrangements revised. A greater part of the buildings were new, and there were three new docks, and the quay walls were still under construction. This gave a favorable opportunity for collecting information relative to docks and their cost, which was very desirable for our service at the time. After another short visit to London a fortnight was passed in examining the extensive naval works at Portsmouth, where I

met with attentions from several of the officers. I was obliged to take Bath on my way to Plymouth, to which several days were given. It had been my wish to visit Pembroke, but the time suggested by the Department for absence had already elapsed, and I proceeded to Liverpool with very short delays at Cheltenham and Birmingham. The extensive docks at this place (Liverpool) and a manufactory of chain cables deserved and received my attention, and my inquiries were fully answered by the politeness of the superintending engineer of the docks and the owners of the manufactory.

Among other interesting persons whom I met here, through the politeness of Maury, our Consul, was Mr. Roscoe.*

In the dockyards of England I was struck with the evidences which everywhere presented themselves of their ability to equip a very large force, at very short notice; to replace promptly any losses that they might sustain in the force afloat, and the immense supplies for probable future wants. The extent, variety and perfection of labor-saving machines, and the completeness of preparation against danger from fires were also very striking.

In France their means for any increase of force were proportionally much less than in England, but their supply of timber and other imperishable materials for the future was greater. In almost every variety of machinery they were far inferior to the English, not less in excellence than in quantity. The fact that the Navy was the first great object in England, and only secondary in France, was apparent even to a superficial observer of their naval establishments and the mode in which they were directed.

The packet in which I returned left Liverpool late in March. My health had considerably improved while in France, where I could adopt a favorable diet.

I reached Washington early in May 1826, made my report to the Department, and, on the 15th was reappointed a Navy Commissioner. Nothwithstanding much inconvenience from ill health, the duties of this situation were performed with very little interruption. An act of Congress was procured by the Department authorizing plans to be made for all the yards, as had been formerly proposed by the Board, and I was appointed in 1827, with Commodores Bainbridge and Chauncey, to prepare the plans, in consultation with Mr. Loammi Baldwin, as engineer.

* William Roscoe, the historian, author of the life of Lorenzo de'Medici.

The confinement and labors of the office rendered all efforts to restore my health of no avail, and were constantly aggravating and increasing my complaints. I therefore resigned my situation as Navy Commissioner, and was appointed to command the Navy yard and station at Boston, on the 1st of June, 1827, and assumed charge of these duties soon after.

* * * * * The examination of the different navy yards and the preparation of plans for the distribution of the docks, store houses, work shops and other buildings, occupied some months. A very considerable enlargement of the Norfolk navy yard was recommended, after considerable difficulty in persuading Commodore Chauncey to concur, against the dissent of Commodore Bainbridge. This has since been purchased and already proves to be too large.

The recommendation for a further purchase there, and for others near Brooklyn, New York, and near the yard in Charlestown, Massachusetts, to accommodate marines, had not yet been adopted. Another, for the purpose of connecting the Navy yard at Brooklyn with the hospital grounds near it, had been made, but not until the price had been enormously enhanced, and conflicting claims had been raised to its free and sole use by the government.

At the Charlestown yard, the construction of some of the works proposed by the new plans, was begun. Some timber sheds, a ship house, store house and quay walls were completed during my command, and the dry dock was well advanced, and the plans for the rope-walk determined upon. It was no small gratification to me to begin the works in this yard, that I might use my influence in giving them the solidity, as well as the simplicity, which, in my opinion, national works should possess, and in the hope that the example once given would be followed in future constructions.

The duties of the yard left me considerable leisure as compared with the duties to which I had been used in the Board of Navy Commissioners. A part of this was applied to the compilation of a system of day signals for the Navy, which might compensate for the defects to which those were justly liable that I had so hastily prepared in 1813, and which had continued in use. They were laid aside at the time, and after subsequent revision they were offered, but not adopted.

In the course of reading Clerk's treatise on Naval Tactics, in 1820, I had found occasion to note in the margin a dissent from some of his conclusions. These became so numerous, at last, and many of his errors appeared so important, that I now determined on a more

formal notice of them. This again led to the collection and examination of accounts of naval actions that had occurred subsequently to Clerk's publication, and finally formed a small volume. This proved to be a very useful occupation, as it led to a careful examination of the advantages and disadvantages of the particular modes of attack and defence under the peculiar circumstances of each fleet or squadron, and the ulterior objects of the respective parties. This latter consideration appears to have been entirely overlooked by Clerk. A similar work was afterward published in England, Ekins's "Naval Battles", which corroborates many of my views of Clerk's errors, and embraces much that I had previously collected respecting other actions.

My health had improved considerably under a strict diet, and in July 1832 it was so far reëstablished that I was again recalled to the Board of Navy Commissioners, Mr. Woodbury being Secretary of the Navy.

After I had notified my willingness to accept this reappointment, I was surprised by a proposition from some Boston gentlemen, for me to take the general charge and superintendence of the railroad, then about to be built, from Boston to Worcester. To my remark that it was a subject on which I had no information whatever they replied that they were perfectly aware of it, and that others would be furnished to attend to all details, and these should be only such as might be acceptable to me. They wished my services as a general superintendent in whose integrity, judgment, and energy, they and the public could place confidence, and they were ready to give $5,000 a year for my services, if I would ask and obtain leave of absence from my public duties for three years.

The offer was very tempting, as the duties would give me exercise conducive to my health. On the other hand my whole life had been devoted to the Navy, and I had been conversant with the various duties of my station, and felt a confidence in my ability to perform them creditably. I had received all the consideration from the goverment I had any right to expect either from the length or character of my services, and in case of future opportunities for honorable employment, I might reasonably expect to be called to fill them, if I remained actively attached to the service, but might be overlooked, if I should seek for advancement in private enterprise.

The proposition was therefore declined, and I proceeded to Washington. The cholera was then raging with much violence at that place, and the family remained in lodgings at Chestertown till late in

October, when it had nearly subsided. My fellow-commissioners were at first Rodgers and Stewart, but the latter left in July 1833, and was succeeded by Chauncey. Commodore Rodgers had but imperfectly recovered from an attack of cholera, and Commodore Stewart was not very regular in his attendance at the Board. These circumstances naturally threw a large share of the labor upon me for the time.

A Board was convened early in 1833, under a law of the previous session of Congress, for the purpose of revising the laws and regulations of the Navy. This was composed of the three Navy Commissioners, the Attorney-General Taney and Commodores Hull and Ridgeley. After much debate and difference of opinion it was proposed that Commodore Stewart should prepare a draft of regulations, which should afterwards be considered by the Board. In the mean time a court of inquiry, of which I was president, had to complete its investigation of allegations made against Lieutenant Randolph of the Navy, for improper detention of public money which he had received when acting as purser.

When this was completed I went to Sackett's Harbor, in March, to ascertain and report on the condition of the ships-of-the-line, which had been begun in 1815, at that place and at Storrs' Harbor. I found the former well sheltered and sound, and recommended her preservation. The other had not been protected from the weather, and was considerably decayed. A recommendation for her sale was carried into effect.

The journey was exceedingly fatiguing, from the state of the roads and the inclemency of the weather. A short visit at my father's gave me some necessary rest, and relieved me from slight indisposition. On my return the revision of the regulations was resumed. It may be remarked that the Attorney-General, Mr. Taney, did not and was not expected to attend the meetings of the Board, but was to examine their proceedings when completed, to see that they did not conflict with any law, and might then propose either additions or modifications.

The general arrangement, as presented by Commodore Stewart, did not meet the approval of the Board. The several articles were considered too large, and embraced too many subjects. None of the Board were familiar with their duties, but my former labor in 1823, on the same subject, gave me some advantage for the present work.

A schedule of the classification of subjects in separate chapters, and an order of arrangement which I presented were approved. It

was then determined to act on these in their order, and finally that the rough drafts of the several articles should be prepared by me, and presented from day to day, for discussion and decision. This my health enabled me to perform, by the aid of my former propositions, in time to prevent any delay.

Commodore Hull was soon succeeded by Commodore Patterson, and Commodore Chauncey succeeded Commodore Stewart as Commissioner, near the close of July. Before the revision of both laws and regulations was completed Wadsworth had succeeded Rodgers and Mr. Butler had taken the place of Mr. Taney.

The several articles of law were carefully and dispassionately considered. A few were passed by only a bare majority, but the greater portion unanimously, or with a very small minority. The change of members, at different stages of the work, required a revision of all that had been done prior to each change, that the new member might have an opportunity of offering amendments, and thus secured additional examinations.

When the regulations were completed by the Board, and sent to the Secretary of the Navy, several of the junior captains, some of the marine officers and some of the surgeons presented their objections, in writing, to parts of them which they considered unfavorable to the interests of the service, or as interfering improperly with the interests of individuals in their classes. Their objections were submitted to the Board, some modifications adopted, and reasons assigned for adherence on other points. This produced a second communication from five junior captains, which was rather deficient in argument, as well as in courtesy, to which a short dispassionate reply was given, and the subject left to the disposition of the executive, who eventually confirmed the revised proceedings of the Board.

Some important modifications were also proposed in the law for the government of the navy, and reasons were given for each change. A law for altering and increasing the pay of the Navy: for changing the titles of master commandant to commander, and sailing master to master: to authorize the enlistment of boys to serve until 21 years of age: to amend the general pension law: to create a fund, and provide pensions for the widows and orphans of officers; to alter the navy ration; and to consolidate certain special appropriations, were also submitted, and the whole sent to Congress. The recommendations were ordered to be printed, but no definite action was then had upon them. Almost all the subjects embraced in the special recommendation have

since been adopted by Congress, however, and in several instances the phraseology has been copied. The old law for the government of the Navy still remains unchanged.

The health of Commodore Rodgers had been much affected by cholera in 1832. Commodore Chauncey was averse to writing and to the labor of tedious investigations. These circumstances threw a full share of the labor on my shoulders, which I was willing to bear as long as my health would allow. In February, 1835, it gave way, and a dangerous illness prevented my attention to office business until the following April.

In 1836, the proposition for an exploring expedition was renewed and received the sanction of Congress and the particular favor of the President, who selected Captain T. A. C. Jones for the command, and adopted his suggestions in relation to the force which was to be employed upon it, and the regulation of the details of its preparation. Captain Jones's original plan proposed vessels of large size and of a different character from that which had usually been employed on such duties, and a larger number than was considered necessary for the object proposed by the generality of officers. As the opinion of the Board had not been required on the subject, and they were thus exonerated from all responsibility, they gave every facility and all necessary orders to carry into effect the wishes of Captain Jones, whenever they were communicated with sufficient precision to preserve the relations which had been created by the orders of the Secretary as derived from those of the President. The Board, however, steadily declined to act on any subject where the exercise of their discretion was invoked by Captain Jones, which would release him from the responsibilities which he had courted, but always gave prompt directions for the execution of any duty, or the procurement of any supplies that he required. The Secretary of the Navy, Mr. Dickerson, who had succeeded Mr. Woodbury in 1834, found himself much embarrassed by the unusual course of business which necessarily resulted from placing the direction of the expedition, in a great degree, without and above the control of the Department.

Notwithstanding all these difficulties, the vessels to compose his squadron were at last prepared at Norfolk, and after trial off the capes, the expedition was officially commenced, under a "General Order, No. 1," by proceeding to New York, to take in supplies and stores that had been collected there. When it was recollected that these vessels were starting upon an exploring expedition, in which

unusual dangers were to be expected, it excited no small surprise among officers in the Navy, to learn that pilots had been sent for to New York, and that they went with the squadron, to conduct it safely from Norfolk to that port.

Shortly after the arrival of Captain Jones at New York, he relinquished the command of the expedition on the ground of ill health. He subsequently published statements, imputing incompetency, or great neglect, on the part of the Board, as among the causes of the delay of the expedition, but he failed to give all the facts that were essential for arriving at any correct conclusion, and thus, as frequently happens, produced all the effects of a false statement upon the public mind. The Board did not deem it necessary to contradict his statements, being willing to rest their reputation on the official correspondence, which was called for and published by Congress. In January, 1838, the arrangements for the expedition, were transferred from Mr. Dickerson, the Secretary of the Navy, to Mr. Poinsett, the Secretary of War. The reason for this change was said to be the infirm state of the health of the Secretary of the Navy. Captain L. Kearney was selected for the command, and he and the Secretary of War decided to employ a sloop of war, the store ship Relief, a schooner, and a merchant ship of about four hundred tons. It appeared to be a part of the arrangement, however, that the Secretary of the Navy should give all necessary orders and thus have the apparent direction. In fact his influence was soon found to be effective, for, upon his objecting to purchase a ship, it was determined to substitute one of the brigs of war for it.

In a conference of the two Secretaries, the Commissioners, and Captain Kearney, on the 17th of January, the general outlines of the plan were agreed upon, apparently to the entire satisfaction of Captain Kearney. To our great surprise he informed us the next day that he had relinquished the command, from an apprehension of insuperable difficulties, with the numerous corps of civilians that was to be employed.

On the 25th of January the two Secretaries verbally informed the Board that it had been determined that the exploring expedition should consist of two sloops of war, the store ship Relief, and a schooner, and that these vessels should be prepared for the service, according to the judgment of the Board. Upon the request of the Board the final instructions given to Commodore Jones were communicated to them for their guidance.

It was by no means pleasant to have this responsibility thrown upon us at this late period, when a proper regard to economy would require the least change compatible with efficiency, and the retention of many arrangements that would not have been adopted as original propositions. The sloops Vincennes and Peacock were selected, and immediate orders given for their special equipment.

Immediately on the relinquishment of the command by Capt. Kearney, I wrote to Captain J. Smith, with the approbation of the Secretary of War, to ascertain whether he would take the command if it should be desired. He stated many objections, the chief of which was the number of the scientific corps, which he thought to be needlessly large; but still he was willing to go if ordered. In consequence of this letter the command was offered to Captain Gregory, but in such terms as led him to infer that a threat was conveyed in case he should decline, and a reward in case of acceptance. He assigned these as reasons for declining. The offer was satisfactorily explained, and an order given early in February, but on his representations, it was revoked about the 20th of February. Captain Smith was invited to visit Washington, to confer with the Secretary of War, and was introduced to him on the 28th of February. He agreed to accept the command, provided Lieutenants A. B. Parkham, Wilkes, and Blake, would willingly form a part of the officers of the expedition, and thus secure to him assistants in whom he could place full confidence. They were accordingly ordered to Washington, but it was found impracticable to make satisfactory arrangements with some of them, and Captain Smith declined the command; but his course received the entire approbation of Mr. Poinsett. After these repeated delays it was finally determined to place the expedition in charge of Lieutenant Wilkes; but even this was near being defeated, by his wishing to make a condition that he and Lieutenant Hudson should receive *appointments* as acting commanders, and his own be the senior.

An entirely new organization of the scientific corps, and an equally new selection of stores and implements was made; but the arrangements were eventually completed and the expedition at last sailed, and finally accomplished objects of much general interest. The greatly protracted delay, after it was first proposed, enabled France and England to anticipate us in the sailing of similar expeditions, and deprived us of some honors to which we might have otherwise established a claim for our country.

In May 1837 Commodore Rodgers relinquished his situation, and was succeeded by Commodore Wadsworth.

Commodore T. A. C. Jones had been employed as inspector of ordnance before he was ordered to the exploring expedition, and had imbibed the idea that a large number of our cannon were so unsafe, from their want of weight, as to endanger the honor and safety of the Navy. Finding that the Board of Navy Commissioners did not coincide with him in this opinion, he induced a member of Congress to call for copies of his reports and to have them printed. This and personal representations to the President, supported by similar opinions from Captain Kearney, occasioned an order for experiments to test the soundness of their views.

The guns more particularly condemned by them were some light 24-pounder guns that had been made when I was on the Board, between 1823 and 1827, for sloops of war, and all other classes of guns that had not at least two-hundred lbs. of metal to one of their shot. In making these objections they appeared to have overlooked the facts, that the sides of a ship presented much less resistance than the walls of a fortification, and that less powder would suffice in naval gunnery, and that Great Britain had been showing practically that a much less proportion than two-hundred to one was amply sufficient to gain all her naval victories since 1793.

The light 24-pounder guns were generally believed to have been made according to my suggestions, which, though not entirely, was substantially correct. I therefore requested the Secretary that I might be designated as one of the Board, to which he acceded. Commodore Jones and Captain Kearney, who had called the safety of the guns in question, and Commodore Patterson and Captain Shubrick, who were uncommitted, were the other members.

The result of the experiments fully established the *safety* of the guns. Their relative *efficiency*, compared with carronades of greater calibre, or long guns of less calibre and equal weight, was decided favorably by a majority, Jones and Kearney dissenting. The opportunity was improved to test some other guns, of new patterns, and the use of shells in guns instead of shot. Though these experiments were very rude, from the want of necessary instruments and conveniencies, the approximations that were obtained were useful by dispelling some unfounded prejudices and fears, and turning attention to subjects which had been too much neglected, and by laying a foundation for further and better investigations.

In the winter of 1836–7 Congress passed a law modifying the operations of previous laws for Navy pensions, and allowing pensions to begin from the date of disability, or of the loss that gave a claim for them. It originated in the House and was awaiting the action of the Senate. On the last day of the session, I happened to be in the lobby of the Senate, when the Chairman of the House committee came in, and urged some of the Senate committee to call it up, and advocate its passage. It appeared not to have been considered by the Senate committee, and they refered to me for my opinion. I had not even seen it. The House Chairman then stated, that it contained nothing new, but was intended merely to give a more equitable effect to existing laws than could now be done. Upon this statement the bill was called up and passed.

It was soon discovered that the bill gave legal effect to claims which would soon absorb the whole of the pension fund, although its amount was so large that its income had hitherto been sufficient to meet all demands upon it. As I had innocently or ignorantly given some aid in obtaining the law I felt it my duty to inform the Secretary of the facts, and of my belief that it would not have passed the Senate if its provisions had been understood; and I urged that he should suspend action until Congress should meet again, that, if they should then desire it, some modification might be made. I found no disposition in the Department to adopt this course, but, on the contrary, a willingness to expedite the admission of claims.

Finding that large sums were granted to persons whose claims were inferior to those which might be presented for my own wounds, it became a question whether I should relinquish, from a motive of delicacy, an advantage to which I was equally entitled, and which nearly all my professional brethren were willing to receive. Those whom I consulted advised the application, and I at last wrote to the Secretary of the Navy, stating the fact that I had been wounded, but, at the same time, that I had so perfectly recovered from it that I had been actually employed on duty almost without interruption since the wounds had been received. In conclusion I asked his decision whether, under these circumstances, I was entitled to a pension and the arrears from the time I was wounded, according to his construction of the law. His answer was affirmative.

Although surgeons of the Navy had certified to the character of my wound, and that it had injured me to the extent of half a total disability, I left the matter for some months. I then presented the necessary

papers, and was soon after informed by the pension clerk that a pension had been ordered for me as a captain, because I had been appointed and had been recognized as a captain, from the date of the action. I waited on the Secretary and explained to him my desire that this arrangement should be changed, and the pension be predicated on my rank as a lieutenant. This I desired because I had considered, and still wished, my appointment as captain to have been given as a reward for my conduct as a lieutenant, which required the pension to take effect after the action, and before my promotion, which would leave me as a lieutenant when the injury was received. The Secretary was unwilling to take this view, from a doubt of its legality, but, at my request, took the decision of the President on the subject. The President assented to my request, and my certificate was granted as a lieutenant, by which I received only half the amount that would have been given if it had been made as captain.

Congress repealed this law soon after, but not before the whole of the fund had been exhausted. By subsequent laws, the receipt of pensions was properly prohibited to any person while he was in the receipt of his pay, unless the disability had prevented his promotion to a higher grade.

In preparing the ship-of-the-line Ohio for sea the Navy Commissioners arranged sleeping rooms for the officers on the orlop deck, for the purpose of keeping the gun decks always clear and ready for action, and from the belief that such an arrangement would contribute to the comfort of the officers themselves, as it would relieve them of the inconvenience of removing their clothing and other effects, whenever the ship was prepared for action. She was also provided with a poop cabin, as the commander of the squadron was to embark in her. When Commodore Hull joined the ship he preferred to mess separately from the captain. This required, in his opinion, that the poop cabin should be assigned to his exclusive use, and rendered it necessary for the captain to occupy the cabin on the main or upper gun deck. The ward-room officers had anticipated that the captain and commodore would mess together, and leave the upper gun deck cabin for their use instead of the lower one, to which the separation of the commodore and captain assigned them. Some of them imagined this separate accommodation to have been owing to the fact that the commodore was to take his wife and her sister with him, and on that assumption endeavored to produce an impression that the ward-room officers had been deprived of accommodations to which they were entitled of right.

The Board resisted this claim, and, by their advice the separate arrangements were confirmed by the Department.

An attempt was made by some of the officers to have this decision reversed, by appeals to the public in newspaper publications, in which many facts were misstated, and much false coloring employed. As auxiliary to their main object, the sleeping arrangements were represented as connected with the other question, and these were described as not only exceedingly uncomfortable, but very dangerous to health.

The main foundation for their complaints was that when the commodore of a squadron was assigned to any vessel, no arrangements which previously existed could be changed for his accomodation, without an infringement of the absolute rights of the other officers. Carried to an extreme this would exclude the commodore from any accomodation which should not be added for his special use, as he could be placed nowhere on board, without interference with some one already established in rooms allotted by usage. The Commisioners, therefore, resisted the demands of the officers, and took the ground that the commander of a squadron was entitled to the first choice of accomodations, within the limits of usage, by his superior rank, as an extension of the general principle which regulated the assignment of accomodations to all other officers in vessels, and in fact to all officers of both Army and Navy, in all countries where quarters are provided for them. In this case I felt justified in departing from my usual course, and had an article published in one of the New York papers, and in a periodical in Washington. The arrangements were continued, and were eventually the cause of further difficulties between the commodore and some of the ward-room officers, in which the latter gained advantages by their own coolness, and by the want of it in the commodore.

At a subsequent period the same arrangements were adopted in the Delaware, and the sleeping rooms were preferred by a large majority to the old arrangements which placed them on the gun decks. The immediate effect, however, was to increase the dislike towards the Board of Navy Commissioners, which had been so industriously promoted during the preceding six or seven years.

One of the complaints urged against the Board was that without any sufficient knowledge to justify it, they had interfered with the naval constructors, and imposed upon them such restrictions as prevented them from giving us vessels with the good qualities that they ought to have possessed, and would have received, if the constructors had been left to exercise their own judgment. In proof of these charges, it

was asserted, that none of the ships which had been built after the establishment of the Board were at all comparable to those which had been built before, excepting always the Ohio, ship-of-the-line. This ship, according to the complainants, was superior to any of our other ships-of-the-line, and its superiority was said to be owing to the fact that Mr. Eckford, the superintending constructor, had refused to accept any of the suggestions of the Board, and had followed his own views. Besides the general object of discrediting the Board, there was a more special object on the part of the naval constructors, which was to obtain a situation for the Chief Constructor, independent of the Board, and that the constructors of the yards should only receive their orders from the Chief Constructor. Not a few of the lieutenants exercised their pens and personal influence in giving publicity to their complaints, and amongst them one using the signature of "Harry Bluff" was the most prominent, from his boldness and from the superiority of his style.*

Notwithstanding these bold and long continued charges, they were entirely destitute of all just foundation, so far as the Board was concerned. In the first place, the records of the office showed conclusively that the Board had never interfered at all with the building draughts of the ships-of-the-line and frigates begun just after the close of the war, in 1815, with the single exception of the Ohio, and in this case not in a manner to affect the form of the immersed part of the hull. With respect to the ten ships or sloops authorized or begun in 1825, restrictions were imposed as to their maximum draught, the difference of draught aft and forward, and capacity required for a given arrangement and complement. With these restrictions, however, the five vessels which were built from the draughts made by the Chief Constructor, conformed to all the requirements of the Board, and were vessels of uncommonly good sailing and other qualities. This fact was a full refutation of the charge, so far as the interference of the Board was concerned; but it better suited the purposes of the complainants to refer to the vessels which were built from the draughts of other constructors, and which had not equally good qualities, and to

* The attacks upon the Navy Board finally resulted in its abolition. By the Act of August 31, 1842, it was replaced by the present Bureau system. That the fault lay with the system rather than with the officers who carried it out is clearly shown by the subsequent appointment of Morris, as Chief of the Bureau of construction in 1844, and of ordnance in 1851, and by his successful administration during the eight years in which he held these offices.

charge these draughts boldly to the Board. It did not seem to strike the writers, that it was rather absurd to assume the Ohio to be superior to the other ships-of-the-line before her qualities had ever been tested, notwithstanding two of the others had been tried, and very favorable reports made upon them by those who had sailed in them.

As little attention was paid to truth in the comparisons of the vessels built under the Board and those which were built before, as in relation to the interference with the constructors. No fair and candid officer would hesitate to admit that frigates like the Brandywine, Potomac, and their class, were more *powerful* than the Constitution or the United States—or to give the same decision in favor of the Delaware and North Carolina, over the Franklin and Washington. With respect to sailing qualities, the old ships-of-the-line might be slightly superior, but for working and all other qualities, the new ships-of-the-line were fully equal or superior. The frigates could compete fairly in all respects, even in sailing. The Brandywine, on her first cruise, outsailed all competitors. This was sufficient to establish her capabilities, and all the other frigates of her class were built from the same moulds below the bends, and with trifling differences above. Subsequent inequalities in her sailing, and in that of others, were fairly attributable to other causes than their forms, and had been experienced by all the older ships.

Unfavorable comparisons were also frequently made between our ships and those of other nations, but no reference was made to the fact that our vessels were designed and begun twenty years before, and had formed the models which it had been the object of other nations afterwards to equal, and if possible to surpass. Neither was any mention made of the surprise and admiration with which all these vessels were viewed by foreign officers, when they first made their appearance abroad.

Many of these attacks, the greater part perhaps, were made by persons entirely ignorant of many important facts, some, and not a few, by those who were incompetent to judge correctly upon the subjects on which they wrote, and some again, from sinister or malicious motives.

The Board made no replies to these anonymous attacks, but willingly left their reputation for intelligence, capacity and honesty, to be determined by time, which rarely fails, sooner or later, to render something like substantial justice, when the subject matter is of sufficient importance to be remembered. When it is not of such importance, an honest man may generally afford to be satisfied with his own approving conscience.

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P. A. Eng. C. H. Manning, U. S. N., in the Chair.

THE VALUATION OF COAL.

By Prof. Charles E. Munroe, U. S. N. A.

Mr. Chairman:—

By the valuation of coal is meant the estimation by experiment of its value as a calorific agent, and it will be admitted that the discovery of some method which will readily give accurate and reliable results, and which will enable us to avoid the costly and prolonged test of actual use—a test which may involve great waste and prove very vexatious—is a great desideratum.

In valuing a coal the estimation of the calorific power is of the first importance, yet there are other characteristics of the fuel to be considered, which will render it more or less suitable for the use to which it is to be put, and which should not be overlooked in an examination of and in deciding upon its fitness. These are the nature of its ash, the readiness with which it burns, the presence of sulphur, and, when the coal is for naval use, the loss by attrition; and in this paper it will be the aim, after briefly stating the properties and composition of coal, and describing some of the means proposed for estimating its calorific power, to allude to the methods employed in the estimation of these secondary properties.

Since the heat developed by a fuel depends upon the union of the carbon, hydrogen, and other combustible constituents which it contains, with the oxygen of the air, and since also the heat produced by the combustion of measured quantities of each of these substances in oxygen has been determined with great accuracy, it would appear a simple thing to determine the calorific power of a coal by subjecting it to an elementary analysis and calculating from the weights of the elementary substances obtained the heat produced by its combustion; and this method has been followed to a considerable extent in the past, but it has been found in practice to give very erroneous results,—some of the sources of which we will consider.

We have in coal a substance whose composition is very variable and very complex; but, as we have no proximate analysis of coal, it is not possible to make this directly apparent, and therefore we must prove the truth of the statement in another way. The following table gives the results of the ultimate analysis of several varieties of coal, and exhibits the variability in its ultimate composition.

	Lesmahagow Parrot Coal, Miller.	Wigan Cannel, Vane.	Coking Coal, Newcastle, Richardson.	10 Yard, Wolverhampton, Vane.	Newport Steam, Miller.	S. Wales Anthracite, Vane.
Sp. Gr.,	1.251	1.276	1.280	1.278	1.309	1.392
Coke, per cent.,	43.3	60.36		59.21	75.10	92.10
Carbon,	73.44	80.07	86.75	78.57	81.47	90.39
Hydrogen,	7.62	5.52	5.24	5.29	4.97	3.28
Nitrogen,	} 11.761	2.12	} 6.61	1.84	1.63	.83
Oxygen,		8.08		12.88	5.23	2.98
Sulphur,	1.145	1.50		.39	1.10	.91
Ash,	6.034	2.70	1.40	1.03	5.51	1.61

An ultimate analysis, however, gives us little real knowledge of the character of a coal, for, as a few experiments will show us, the substances we have determined do not exist wholly in an elementary condition in it. Let us first examine the coal by subjecting a weighed quantity in a confined space to the action of a rarefied atmosphere and heat. We shall find that a considerable amount of gas is evolved from the coal, that this gas is a mixture of compound gases, and that in our ultimate analysis we have estimated their constituents as simple substances. The following table gives the results of some of Mr. Thomas' analyses made in the way described: —

	C. C. of gas from 100 grms., evolved at 100°.	Percentage Composition of Gas.					
		CO_2	CO	CH_4	C_2H^6	O	N
Lignite, Bovey, .	114.3	96.74	2.80	——	——	——	0.46
Cannel, Wigan, .	350.6	9.05	——	77.19	7.80	——	5.96
Jet, Whitby, . .	30.2	10.93	——	C_4H_{10} {	86.90	——	2.17
Bituminous coal, S. Wales,	55.9	36.42	——	——	——	0.80	62.78
Semi-bituminous, "	73.6	12.34	——	72.51	——	0.64	14.51
Steam coal, "	218.4	5.46	——	84.22	——	0.44	9.88
Anthracite, "	555.5	2.62	——	93.13	——	——	4.25

If, in addition to this, we heat the coal in closed vessels, out of contact with the air, if the coal be other than anthracite we shall find that in addition to the gases evolved, as given above, the coal will yield a large number of substances, solid, liquid, or gaseous, which exist already formed in the coal, or which are produced by the action of heat on substances existing in the coal, and there will be left behind a mass of coke. We may thus prove the complex composition of the coal, but our methods of analysis do not yet admit of our estimating these constituents.

However, our ultimate analyses have shown that carbon is the most important element present, and it is probable that it exists to a large extent in the coal in a free state. Let us consider what would result if we were to estimate the calorific power of the carbon present from a simple determination of the percentage of free carbon. Carbon is one of the elementary substances which exists in several allotropic or unlike states. In all of these its chemical properties are precisely the same, though its physical properties are widely different. These differences are believed to be due to the difference in the arrangement of the atoms in the molecules. Among other differences Favre and Silbermann have found that their heats of combustion differ considerably, increasing inversely as the density, as the following table, embodying their results, shows.

Substance.	Product.	Units of Heat.	Density.
Wood charcoal,	CO_2	8080	1.500
Gas-retort carbon,	"	8047	1.885
Native graphite,	"	7797	2.300
Artificial graphite,	"	7762	——
Diamond,	"	7770	3.530

* "These figures point to the conclusion that the heat of combustion of an elementary substance depends not only on its chemical constitution but also upon its physical state before combustion. It varies not only with the nature of the atoms but also with the manner in which they are grouped together. We cannot deduce the calorific power of graphite from that of charcoal, nor that of the diamond from either. If, then, the mere fact that a substance is composed of pure carbon is not sufficient to determine its heat of combustion, it is not reasonable to suppose that the like information can be acquired in the case of so complex a substance as coal, by a calculation based only on a knowledge of the quantities of carbon, hydrogen and oxygen which it contains." These substances exist in the coal in a state of combination, the compounds of the various elements being mixed together. Hence, when they are burned these compounds must be broken up before they can unite with the oxygen of the air, and, as a general rule, heat is absorbed by the analytical process, and consequently the true heat of the combustion of the coal will be less than the calculated result. Should the compounds, however, be of such a nature that their decomposition is attended with an evolution of heat, the true heat will be greater than the calculated.

Another source of error is due to the fact that the calorific power of hydrogen was determined when that substance was in the gaseous state. Now hydrogen would certainly exist in the coal in a solid or liquid state, and, during the process of combustion, would be converted into a gas. We know that if a solid or liquid is converted into a gas, heat is absorbed. "Therefore, even if the assumption that the 'available' hydrogen is not combined with any of the other elements present in the coal were correct, the calculations themselves would be open to objection, since the hydrogen in its conversion to the gaseous state would absorb heat. Hence, in assuming that the calorific power of solid hydrogen is, like that of gaseous hydrogen, 34,462 units, we commit an error, the existence of which we are certain of, while we are totally ignorant of its magnitude."

Experimental proofs are not wanting to confirm the doubts which theory suggests as to the accuracy of this method of calculation. Two physicists,† Scheurer-Kestner and C. Meuniér, have made a long series of experiments on the heat of combustion of coal. They analyzed numerous specimens, calculated their calorific power by the ordinary

* "Coal: Its History and Uses," Prof. Thorpe; page 243.

† Ann. phys. et chim, 4 ser., t. xxi. et. xxvi.

rules, and then made direct experiments to determine their heat of combustion. A comparison of the numbers obtained by calculation and observation proved that they did not agree. Thus in the case of two coals, one from Ronchamp and the other from Creusot, which contained almost precisely the same proportions of carbon, hydrogen, and oxygen, the calorific powers, instead of being identical, were 9,117 and 9,622 respectively. The difference between the real and calculated calorific powers amounted in some instances to as much as fifteen per cent. In the case of two specimens of coal from England, and several from France, the calculated heat of combustion was too small. In that of six kinds of brown coal from France and Germany it was too large, while experiments on several different coals from Russia proved that in these cases the discrepancies between calculation and experiment were comparatively unimportant. It is evident then, that in order to determine the calorific power of a coal with precision we must resort to direct experiments, and that we cannot trust to the calculations based on the elementary composition of the coal. To determine this factor with accuracy we must use the delicate calorimeters employed by the physicist, and at the same time estimate the amount of incombustible matter present. But such precise results are not necessary for the examination of coal for use in the generation of steam; coarser methods will yield results which are sufficiently accurate for this purpose, some of which we will consider.

Thomson has devised a calorimeter which has sometimes been used for determining the calorific power of coal. It consists of a thin, copper cylinder placed inside another, of similar material, which is perforated with holes at the bottom and furnished with a stopcock at the top. The coal to be examined is finely powdered and mixed with ten to twelve times its weight of a mixture of three parts of potassic chlorate and one of potassic nitrate, and this mixture, which will burn out of contact with the air, is then placed in the inner cylinder and the whole submerged under a known weight of water. As the mixture burns, the hot gases bubble up through the holes and warm the waters, until the combustion is completed, when the stopcock is opened and the water flows in to fill the vessel. The heat of combustion is deduced from the elevation of temperature of the vessel and water. The quantities of coal and water employed are so adjusted as to make the calculation extremely simple. It has been shown, however, by Dr. Percy, that there is an error in this method, due to the fact that the bubbles of gas which escape are not completely cooled when passing

through the water, and that the loss of heat on this account is not unimportant. I have not as yet given much thought to this form of calorimeter; but it would seem an easy thing to overcome, by some simple mechanical device, the fault which Dr. Percy has pointed out, and thus secure a useful, though not a precise instrument.

A more practical method among those of a less refined and delicate nature is that of Berthier. This depends upon the fact that carbon, when heated in the presence of litharge, reduces the litharge in accordance with the following reaction,—

$$2PbO + C = CO_2 + 2Pb$$

and, calculating from the known atomic weights of carbon and lead, we find that for every gram of carbon present, thirty-four and five-tenths (34.5) grams of lead will be obtained. Berthier proposed to perform the experiment by heating the coal, in a finely-divided state, in a crucible, with about forty times its weight of litharge, and continuing the process at a red heat, for some time. The crucible was then allowed to cool; it was then broken, the button of lead extracted, washed, dried, and weighed, and on the above equation the weight of carbon calculated. Suppose we find that a given sample yields 25 grams of lead; then the heating power is $\frac{25}{34.5}$ of that of pure carbon, or assuming that 1 kilogram of carbon raises 7,900 kilograms of water 1° C., 1 kilogram of the sample of coal is capable of raising 5,724 kilograms of water 1° C. To estimate the evaporative power by this method. we have simply to divide the number of units of heat obtained by 537, the units of heat necessary to vaporize 1 kilogram of water at 100° C,

Many objections to this process have been raised, but it seems to me as unobjectionable as any that have been devised. Among other objections it is urged that hydrogen may be present in the coal to a greater extent than the oxygen necessary to combine with it to form water, and that this free hydrogen, if we may so term it, will reduce a part of the lead, and that by assigning the whole to the carbon very serious errors may be introduced. On the other hand, it may be said that according to the reaction,—

$$PbO + 2H = H_2O + Pb$$

one part of hydrogen will reduce 103.5 parts of lead, while one part of carbon reduces 34.5 parts of lead, or 3 : 1; but at the same time the units of heat produced by the hydrogen are to those produced by an equal weight of carbon as 4.265 : 1. Now, as the hydrogen is in the solid condition, some heat will be absorbed in converting it into a gaseous form: therefore, in valuing the coal for purchase, when this error exists

it will be in the right direction. In using the method, however, I have found a source of error which has led me to modify the details of it. When a crucible is used it is placed in a furnace where it is difficult to manage, and there is great danger of the reducing gases of the furnace reaching the litharge. Hence, instead of the crucible I employ an iron tube, or gas pipe. Into a piece of gas pipe (ungalvanized) one inch in diameter and one foot long, a plug, tightly fitting, is screwed at one end, and a second piece of pipe, one half inch in diameter and three feet long, is screwed at the other. One gram of the coal to be examined, finely powdered, is now mixed with about forty times its weight of litharge, and poured into the tube and covered with a small quantity of litharge. The tube is then placed in the furnace under a boiler, the open end extending out six inches, and allowed to remain there until upon placing the finger over the open end no pressure is felt. The process does not occupy over ten minutes. The tube is then removed, the closed end rapped sharply on the hearth to cause all the molten lead to descend, and it is then placed in a vise. In the mean time a small box is lined with plaster of Paris for the reception of the lead. This is placed under the tube and the plug is removed and the lead allowed to run into the box. During this operation the tube is rapped with a hammer to facilitate the escape of the molten lead. After the tube is cooled it is frequently found that some of the metallic lead has been caught in the thread, but it is easily got out. Care must, however, be taken not to mistake fused litharge for metallic lead. The lead which is now collected is washed, dried, and weighed, and the calculation made as above. It is found that after a tube has been used two or three times it gives more constant results than at first.

The following determinations, made in this laboratory, prove that this process gives closely agreeing results. One gram of coal was taken for each experiment.

Coal.	Wt. Lead.	Calorific Power.
Lee Wilkesbarre (anthracite)	31.60	7235
"	31.65	7247
"	31.09	7099
"	31.13	7128
Newburgh Orrel (bituminous)	31.61	7238
" "	31.26	7158
Lao-ping (Chinese) "	27.10	6206
" "	27.46	6288
" "	27.47	6290
" "	27.1	6205

Lignite	23.60	5404
"	23.19	5311
"	23.97	5489
"	23.29	5457
"	23.58	5400
"	23.55	5393
Peat	22.75	5209
"	22.63	5182
"	22.42	5135

All but the last four of these analyses were made by Lt. Charles Belknap, U. S. N., Instructor in Physics and Chemistry. The last four were made by Cadet Eng. A. T. Woods, U. S. N.

In order that the process should give reliable results, it is essential that the litharge should be pure. If, as was the case with Johnson's experiments, the litharge contains minium the results will be too low. As some experimenters have found it difficult to obtain constant results with litharge, Mitchell has proposed the use of the ordinary carbonate of lead, but I am disposed to believe that this would be an unwise change, as the composition of the carbonate exhibits greater variations than that of the litharge. It has been said of Berthier's process that in the Admiralty investigation the results exhibit a variation often amounting to a virtual contradiction of the simultaneous results of direct combustion; but Johnson, on the other hand, gives results, to be cited farther on, in which the evaporative power, as determined by experiment, and the results of the litharge test closely agree. It may, however, be urged with some degree of fairness that too small a sample of the coal is taken for examination for us to be able to draw any useful conclusions as to the properties of the mass of the coal from the results; but this argument is equally valid when used against any laboratory process, such as the ultimate analysis, or the determination of the calorific power by a calorimeter; yet if care has been used in selecting lumps of the coal which represent the average character, and then these lumps are finely powdered and intimately mixed, any part of this will fairly represent the average quality of the mass; or we may follow the course prescribed for the assay of an iron ore. Break up in an iron mortar forty or fifty pounds of the coal into pieces that will pass through a sieve with one-half inch meshes. Thoroughly mix the fine and the coarse. Now break up about ten pounds of this mixture so that it will pass through a sieve with one-fourth inch meshes. Mix well: take one pound of this and pulverize

until it will pass through a sieve of sixty meshes to the linear inch. Mix well: take out fifty grams, pulverized in agate mortar and pass through muslin bolting cloth. Of course in the analyses given the whole of this course of procedure was not followed, as we sought only to test the accuracy of the method by concurring results and not to analyze the coal.

L. Gruner* has also arrived at the conclusion that the calorific power of a coal cannot be accurately determined by its elementary analysis. He holds that a more correct estimate of the heating power of a coal is obtained by determining the average amount of coke which it yields. The higher the yield of coke the greater is the heating power, but this heating power does not diminish in the same ratio as the yield of coke; thus for a decrease in the yield of coke from 80.4 to 59 per cent., the heating power diminishes only from 9622 to 8215. In using the percentage of coke as an estimate of the value of the coal Gruner conflicts with other investigators who hold that it is an uncertain guide, since wide differences have been found in the evaporative power of different coals which possessed an equal average amount of fixed carbon. From the consideration of the amount of coke it will be seen that he is led to a system of classifying coals which is almost identical with Johnson's published in 1844.

He groups the different kinds of coal arbitrarily in five classes, as follows, though there is no distinctly marked division between any two.

Distinguishing Property	Elementary Composition: C	H	O†	Relation of $\frac{O}{H}$.	Residue of Coke on Distillation.	Appearance of Coke.
Dry coal, burning with a long flame.	75 to 80	5.5 to 4.5	19.5 to 15	4:3	0.50–0.60	Powdery, or slightly caked.
Bituminous coal with long flame, or gas coal.	80 to 85	5.8 to 5	14.2 to 10	3:2	0.60–0.68	Fused, but deeply seamed.
True bituminous coal, or smithy coal.	84 to 89	5 to 5.5	11 to 5.5	2:1	0.60–0.74	Fused, and tolerably compact.
Bituminous coal with short flame, or coke coal.	88 to 91	5.5 to 4.5	6.5 to 5.5	1	0.74–0.82	Fused; compact; very slightly seamed.
Anthracite coal.	90 to 93	4.5 to 4	5.5 to 3	1	0.82–0.90	Powdery.

* Ann. Min. 1873, IV, 169.

† The O includes N, but the latter rarely exceeds 1 per cent. of the combustible matter.

The length of the flame depends on the amount of volatile matter; the combustibility of the coal on the nature of the ash. If the ash contains iron and lime, a slag forms; if it contains alumina and silica, it remains in a powdery form, which is more favorable to the combustion of the coal. The first class, *dry coal with long flame*, is used for making coke. The Sp. Gr. is about 1.25. The color is usually brownish. A proximate analysis gives—

Coke.	Ammoniacal liquor.	Tar.	Gas.	Volatile matter.
50–60	12–5	18–15	20–30 per cent.	50–40 per cent.

Calorific power, 8200–8300. As soon as the carbon exceeds 80 per cent. and the oxygen is under 15 per cent., this class of coals begins to coke on heating.

(2) *Bituminous coal with long flame* (gas coal).—The coke obtained from this coal is always caked together. The coal itself is hard, the fracture laminated. The Sp. Gr. is 1.28–1.30. Color, pure black, with strong luster. Proximate composition—

Coke.	Ammoniacal liquor.	Tar.	Gas.
60–68	5–3	15–12	20–17 per cent.

Volatile matter, 40–32 per cent.; Calorific power, 8500–8800.

(3) *True Bituminous, or "Smithy Coal."*—Color, pure black, with high luster; brittle, with laminated fracture. Fuses when burning, leaving the coke in a compact cake. Sp. Gr. 1.3. Proximate analysis—

Coke.	Ammoniacal liquor.	Tar.	Gas.
68–74	3–1	13–10	16–15 per cent.

Volatile matter, 32–26 per cent.; Calorific power, 8800–9300.

(4) *Bituminous coal with short flame, or "Caking coal."*—This class exhibits the same properties as the previous one; its luster, however, is not so great. It is very brittle, and although it is termed *dure* in France, this means that it does not burn away quickly. It does not contain much volatile matter, and is consequently difficult to kindle. Sp. Gr. 1.30–1.35. Proximate composition—

Coke.	Ammoniacal liquor.	Tar.	Gas.
74–82	1–1	10–5	5–12 per cent.

Volatile matter, 26–18 per cent.; Calorific power, 9300–9600. One kilogram of this coal evaporates 9.75 kilograms of water.

(5) *Anthracite Coal.*—This coal forms the link to pure anthracite. It is black, and shows dull streaks. Its cohesion is slight, but increases the nearer it approaches the character of pure anthracite. Sp. Gr. 1.35–1.40. Proximate composition—

Coke.	Ammoniacal liquor.	Tar.	Gas.
82–90	1–0	5–2	12–8 per cent.

Volatile matter, 18–10 per cent.; Calorific power, 9200–9500. One kilogram, calculated without ash, evaporates 9.15 kilos of water; but as it usually contains 10–11 per cent of ash, its real evaporative power is 8.12 kilos.

C. Hilt * likewise regards the yield of coke, together with the amount of ash, as of especial importance in the valuation of coal. He gives a classification of coals according to the ratio between the quantities of bitumen and coke which they yield when ignited in a covered crucible.

	Bitumen : Coke.		Bitumen : Coke.
1.—Anthracite, . . .	1 : 2	to	1 : 9
2.—Flint coal (old), yielding but little gas,	1 : 9	to	1 : 5.5
3.—Coking coal, ...	1 : 5.5	to	1 : 2
4.—Coking gas coal, . . .	1 : 2	to	1 : 1.5
5.—Flint coal (young), yielding much gas,	1 : 1.5	to	1 : 1.25
6.—Gas coal, ...	1 : 1.25	to	1 : 1.1

If the bitumen or volatile matter be expressed in terms of ash free coke we have—

	Bitumen.		Bitumen.
No. 1 contains	5 to 10 pr. ct.	No. 4 contains	33.3 to 40 pr. ct.
No. 2 contains	10 to 15.5 pr. ct.	No. 5 contains	40 to 44.4 pr. ct.
No. 3 contains	15.5 to 33.3 pr. ct.	No. 6 contains	44.4 to 48 pr. ct.

About the year 1842 Prof. W. R. Johnson began, under the auspices of the Navy Department, a series of experiments to determine which, among our many varieties of coal, was best adapted to and most economical for the purposes of the navy. Similar investigations were also subsequently undertaken by Dr. Lyon Playfair and Sir Henry de la Bêche with the British coals. In both these researches the following principles were stated as governing the end sought.

1st. The fuel should burn so that steam may be raised in a short period, if this be desired; in other words it should be able to produce a quick action.

2nd. It should possess high evaporating power—that is, be capable of converting much water into steam with a small consumption of coal.

3d. It should not be bituminous, lest so much smoke be generated as to betray the position of vessels of war when it is desirable that they should be concealed.

4th. It should possess considerable cohesion of its particles so that

* Ding. Pol. Jour., CCVIII. 424.

it may not be broken into small fragments, by the constant attrition which it may experience in the ship.

5th. It should combine a considerable density with such mechanical structure that it may be easily stowed away into small space—a condition which in coals of equal evaporative values often involves a difference of more than twenty per cent.

6th. It should be free from any considerable quantity of sulphur, and it should not progressively decay, both of which circumstances render it liable to spontaneous combustion.

Great importance was attached to the determination of the evaporative power which was accomplished by burning weighed quantities of coal under a boiler of known dimensions and measuring the quantity of water evaporated. Of course, at the same time the area of the grate surface, of the combustion chamber, of the heat absorbing surface and the length and area of the flues were also known. The conditions under which the experiments were conducted were apparently like those which exist in practice, and promised to lead to positive results, yet the results given in Johnson's Report in 1844, and the British series of reports, concluded in 1851, after showing that no fixed relation exists between the calorific power as calculated from the results of analysis and the evaporative power of the coal, also "prove, by the very differences which they exhibit, that the only trustworthy method of determining the value of a fuel for steam purposes is that of practical experiment under the boiler in which it is to be used, and where several tons and not pounds are consumed." The results of such experiments cannot, however, be considered as applying to furnaces and boilers dissimilar to those actually used. The conditions attending the advantageous combustion of coal resemble those which obtain for the combustion of coal gas for illuminating purposes. To obtain the highest photometric power for a given gas, a certain form of burner, number of apertures, rate of flow, and length of chimney are found essential, and these are determined by experiment. To get the maximum effect with a gas from another source, some or all of these conditions must be varied. For this reason, and others which might be given, notwithstanding the conclusions of the Admiralty's Board, the results of laboratory experiments which are conducted under similar conditions for different coals cannot but be of value in deciding the fitness of a fuel for the purpose to which it is to be applied.

In the English experiments, besides the determination of the evaporative power, Berthier's litharge test was applied, and the loss by attrition

was also estimated. "This factor, which is of extreme importance in steam navigation, becomes reduced the more the cleavage of the coal or the shape of the fuel approaches the form of a cube. In order to attain at least a relative idea of the waste occasioned by transport, i.e., of the attrition of the individual pieces of coal against each other, and the conversion of unbroken coal into dust, unfit for use, which is occasioned by the motion of the vessel, the various specimens were rotated in a drum for the same length of time, and the dust thus produced separated and weighed." The subjoined table shows some of the results of the British investigation. 1. No. pounds of water at 100° C. converted into steam by one pound of fuel. 2. Ditto after deducting portions of coke contained in ash. 3. Theoretical evaporative power in pounds of water at 100°, as calculated from litharge test. 4. Weight of coal per cubic foot of stowage in pounds. 5. Ditto per solid cubic foot deduced from specific gravity. 6. Percentage loss by equal amount of attrition.

Kind of Fuel.	1	2	3	4	5	6
Welsh—						
Jones & Co. Anthracite,	9.46	9.70	13.84	58.25	85.79	68.5
Ward's Fiery Vein,	9.40	10.60	16.40	57.43	83.85	46.5
Graigola,	9.35	9.66	16.72	60.17	81.11	49.3
Duffryn,	10.14	11.80	15.64	53.22	82.72	56.2
Pouty Pool,	7.47	8.04	14.31	55.70	82.35	57.5
Ebbro Vale,	10.21	10.64	16.68	53.30	78.81	45.0
Bedwas,	9.79	9.99	14.70	50.50	82.60	54.0
Scotch—						
Dalkeith Jewel,	7.08	7.10	13.77	49.80	79.67	85.7
Wallsend Elgin,	8.46	8.67	15.15	54.60	78.61	64.0
Fardel Splint,	7.56	7.69	15.12	55.00	78.61	63.0
Grangemouth,	7.40	7.91	14.85	54.25	80.48	69.7
English—						
Broomhill,	7.30	7.66	13.20	52.50	77.99	65.7
Park End, Sydney,	8.52	8.98		54.44	80.05	55.0
Irish—						
Slieverdagh,	9.85	10.49	16.21	62.80	99.57	74.0
Mean of three patent fuels,	9.27	9.66	15.44	66.48	70.66	

From the examination of this table and a comparison of columns 2 and 3 it will be seen that the litharge test occasionally gives results at variance with those obtained by the evaporative test, but as a rule they are concurrent. When the results disagree it would be interesting to know what results are actually obtained in practice.

The results obtained by Johnson are more concurrent, and are

exhibited in the following table, together with the results of M. Baudin by the litharge method:

No. of specimens assayed.	Nature of coals.	Evaporative power, by experiment.	Lead reduced by 1 of combustible.
8	7 Penn. anthracite, 1 natural coke of Va.,	10.537	32.157
11	Md. and Penn. free-burning coals,	10.877	31.736
10	Va. bituminous,	9.523	28.194
8	Foreign and western highly bituminous,	8.710	27.740
3	French anthracites,		33.520
3	Free-burning coals,		32.040
3	Bituminous coal,		29.830
3	Highly bituminous,		27.586

Prof. Johnson believed the lead-reducing power of the coal to depend on the carbon constituent, and cites the following instances in support of this view: The ultimate analysis of Cambria county, Penn., coal gave 91.955 per cent. of carbon, and experiment showed its lead-reducing power to be 31.464. Again, ultimate analysis showed Clover Hill, Va., coal to contain 83.393 per cent. of carbon, and this on experiment yielded 28.527 parts of lead. Now the ratio of the percentages of carbon is to that of the lead produced as follows: $\frac{91.955}{83.393}=\frac{31.464}{x}$, where $x=28.534$, which may be considered as identical with that obtained by experiment.

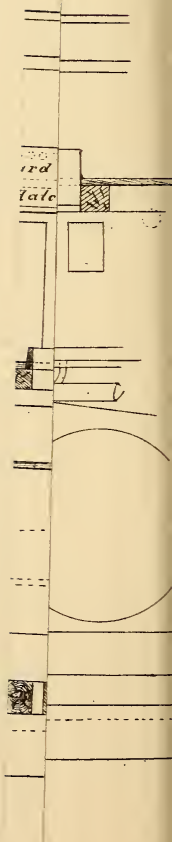
Important experiments upon the evaporative power of American coals and of the evaporative efficiency of different boilers and furnaces have been carried on for some years and are still being pursued by a board of Engineers of the Navy, under the direction of Chief Engineer B. F. Isherwood, and it is probable that, as our data accumulate, we may be able to discover some closer relation between the results of experiment and those of use; but the value of these results would be greatly enhanced if the fuels employed were also subjected to analysis, and their calorific powers determined by the various methods suggested, for we might, from the data thus collected, be able to effect the complete solution of the problem stated at the opening of this paper.

The presence of sulphur in coal may sometimes be detected by simple inspection; for as it frequently exists in the form of iron pyrites, these, or the rust produced by the weathering of the crystals, may generally be readily observed. Sometimes these crystals may be so

finely disseminated through the mass that they cannot be seen, or the sulphur may be present in another form. A rough way for detecting the sulphur may then be used, which is as follows: The powdered coal is fused in an iron vessel with twice its volume of carbonate of soda. The fused mass, when cold, is then placed on a bright silver or copper surface, and moistened with water. If sulphur is present the metallic surface will be blackened by the formation of a film of sulphide. To make sure that the carbonate contains no sulphur it must first be fused and tested in the same way. I have now in hand some experiments by which I hope to test for sulphur at the same time that I am making the lead test, the results of which will be given later.

The nature of the ash, the readiness with which the coal burns, and the determination of the amount of ash, are factors which are only to be obtained by the combustion of the coal. The process usually followed, of burning the weighed coal in a weighed iron vessel, is correct in principle, but of course as conducted in the laboratory the errors incident to the corrosion of the iron when heated are avoided by the use of non-corrosive material. In every way, too, the process used there is more delicate: yet the process used in the engine-room gives fair results.

NOTE—The calorific power given by Scheurer, Kestner and Meunier were determined by experiment with Favre & Silbermanns calorimeter. The data given by Gruner are also the results of experiments.



WASHINGTON BRANCH,

April 13, 1880.

Medical Director T. J. Turner, U. S. N., in the chair.

THE VENTILATION OF SHIPS.

By Passed Assistant Engineer G. W. Baird, U. S. N.

Mr. Chairman and Gentlemen :—

I think that the carbonic acid exhaled from our lungs or produced by combustion on board ship is not nearly so injurious to health or comfort as the foul gases of the bilge or the organic matter from our exhalations. While serving on board the Pensacola—a vessel not over-crowded—we found the organic matter, deposited upon the knees, beams and ceiling of the vessel, on the berth deck, sufficiently thick to be wiped off by a pocket handkerchief, and clearly distinguished upon its surface.

In 1854 Dr. Thompson found that "the air of London when passed through oil of vitriol communicated a dark tinge to it, and if large quantities of air were passed through distilled water, the inevitable result was the formation of fungi." And Dr. R. Angus Smith, (Op. Cit. p. 217,) tested the air for organic matter and found the proportion in the air. This table, published in the *Chemical Gazette* of 1859, is as follows :—

LOCALITIES.	Number of grains of organic matter in 100 cubic inches of air.
Manchester, England,	52.9
In a pig-sty,	109.7
Thames, in warm weather,	58.4
Thames, Lambeth,	43.2
Thames, Waterloo bridge,	43.2
London, in warm weather,	29.2
London, after a thunder storm,	12.3
Northern Italy,	6.6
German Ocean,	3.3
Lake Lucerne,	1.4

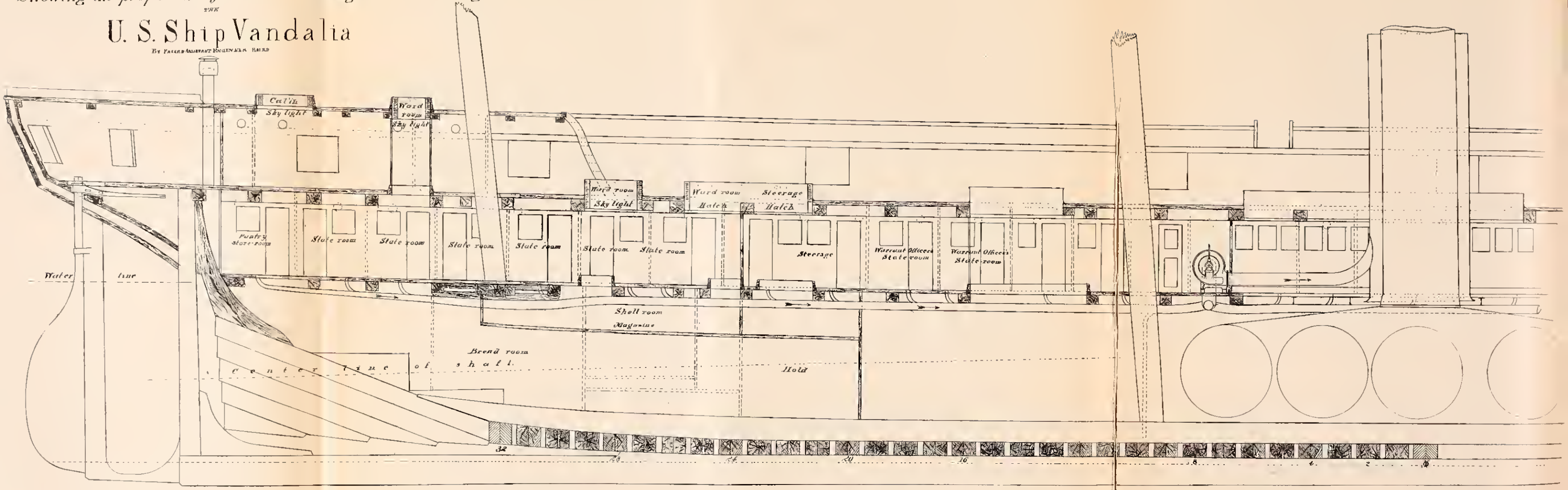
PLATE I

Showing the proposed system of ventilating and warming

THE

U. S. Ship Vandalia

By Passed Assistant Engineer Baird



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German Ocean,	3.3
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It will be seen that the amount of organic matter varies considerably in different localities and under different circumstances, and I regret that I am unable to give the proportion of this poison found on board our ships. It is a subject now under investigation by the surgeons of the Navy, and, though the tests for it are complicated, I hope at no distant day to see a full analysis, as found on board all classes of our vessels, published by the Medical Bureau.

Pasteur supposed "that germs of infusoria were present in all air, and the cause of fermentation and putrefaction," and Van der Broeck, Shroeder and Deuch have confirmed his views. They found that almost all organic substances, even those of ready putrefaction, such as blood, fibrine, albumen, sugar, etc., were preserved unaltered when heated to the boiling point in a bottle, stopped by a loose plug of raw cotton, so that in cooling the entering air would be filtered and deprived of floating solid substances.

The amount of carbonic acid in the air seems to be as inconstant as that of organic matter. In the densely populated parts of Europe we find a much greater quantity than in any parts of America, excepting in the volcanic regions of South America. Dr. Wetherell estimates the mean amount of carbonic acid in the air, for all parts of the world, to be four parts in ten thousand, so that in estimating the amount of air necessary for the dilution of this gas to its normal, we will base our calculations on this fraction.

The quality of this gas appears to be more deadly than its quantity, for I have read that La Blanc found that "a bird died in a room containing less carbonic acid than existed in the air of many apartments he had examined; and a dog survived longer in air containing the enormous amount of nineteen hundred and ninety-one volumes per ten thousand of carbonic acid than in an atmosphere from burning charcoal in which three hundred and one volumes of this gas were present." The cause of the latter superior deadly effect was attributed, by competent authority, to the presence of the poisonous carbonic oxide, emitted by imperfect combustion.

The presence of carbonic acid on board ship, when produced by exhalation, is an indication of the presence of organic matter, and they bear, in that case, nearly a constant relative proportion to each other, so that the tests now being made on board our ships for carbonic acid may be relied upon as an index for organic matter as well. What this ratio is I am unable at present to say, but I hope soon to see published the work our surgeons are now doing on this subject.

Pettenkoffer, La Blanc, Roscoe and others have made some very interesting experiments on the escape of carbonic acid through the crevices of rooms, condensation upon the surfaces of, and diffusion through the walls of apartments, but I have not been able to find any similar tests for organic matter. Dr. Wetherell, in his celebrated experiments found the carbonic acid in the public schools of Washington ranged from 9.342 parts in ten thousand, to 17.184 in ten thousand, and during the same month he found only from 4.275 to 7.355 parts in the United States Senate Chamber, and while there were no complaints from the schools of ill ventilation, we have heard many from the Capitol extension. There must have been some other offensive matter than the carbonic acid in the Senate and House of Representatives, and it may have been organic matter, for we are informed that Professor Leeds found decaying animal and vegetable matter in the very conduits which bring the air from the fans to the Senate Chamber and the House of Representatives.

On board ship we have more than this to contend with. On board all new ships, and also those which have been lately repaired, we find the bilge pumps frequently choked up by chips and shavings. As the bilges are cleaned and inspected before a vessel leaves the navy yard to commence a cruise, we naturally ask where these shavings come from? We observe they appear most abundant when the ship has considerable motion, and infer that they must have worked or fallen down from between the timbers where the ship is ceiled in. As this stuff decays it evolves gas abundantly. Letting water into the bilge and pumping it out daily will remove the bad odors, but if the watering be neglected for a single day the stench is worse than usual. In order to prevent the evolution of gases by the bilge we must keep it dry. The large amount of air received into a ship through the wind sails alone is more than enough to purify the air so that no trace of odor could be detected, were the air properly distributed; but this blast takes the most direct course to the nearest outlet and escapes, causing, in its passage, but feeble eddies in the other parts of the vessel. It is evident that we must *remove* these foul and poisonous gases first, and afterwards direct our attention to the supply of fresh air.

Direction of the Products of Respiration.—The question which now presents itself is whether it is better to remove foul gases through openings near the floor or near the ceiling.

Mr. Goldsworthy Gurney, who ventilated the House of Commons, informs us that the breath is forced downwards to the ground from the

nostrils, and I believe he went so far as to declare that it took the direction of a definite mathematical curve. From the experiments of Roscoe, Dr. Wetherell, and others, we learn that the atmosphere, in large rooms occupied by man, is as rich in carbonic acid near the ceiling as at the floor. Those who advocate the system of ventilation by aspiration (or exhausting the foul air) have not always stated this fairly, having cited isolated cases of analyses instead of taking the mean of a great many observations. The first one who attacked this problem fairly was Dr. Wetherell himself, and I cannot do better than to quote him *verbatim*. "On March 27, 1865, at 1½ P. M., in the laboratory of the Smithsonian Institution, the temperature of which was 69.26° Fahr., a delicate thermometer, held in the hand for several minutes, indicated 95.36° Fahr. Held in the mouth, and observing the degree by the aid of a mirror, it indicated the same temperature. Upon smoking a pipe with a stem of wood six inches long, slowly, with the thermometer also in the mouth, the temperature did not sensibly rise. Having thus obviated a source of error from any supposed heat in the tobacco smoke, I experimented upon the air currents of the breath, both while sitting and standing, following them readily by the aid of the smoke. Before expulsion the smoke was held in the mouth for a short time to insure its temperature to be the same as that of the breath, and the hot pipe was held or placed aside. When the smoke is expelled gently from the nostrils, as in the act of breathing, it proceeds downward a foot or less, and then rises rapidly."

I think this experiment, which any one may easily repeat, should set aside the vicious theory that the heavy carbonic acid in the breath we exhale carries it rapidly and certainly to the floor. The many analyses of air taken from different parts of a large room do not show that its superior specific gravity carries it certainly downward. The carbonic acid probably diffuses itself rapidly with the pure air present, and its direction is affected very much more by natural air currents than by its superior weight. In his experiment the Doctor neglected to note whether or not the windows were open, or whether any currents were induced by the fire, which at that season was burning; and though he demonstrated fairly that the exhalations do not essentially flow downward, I think he has not proved the opposite.

Fig. 1 is a transverse section of the fifth state room on the port side of the Vandalia's ward room, which is opposite a hatch and is near a wind sail. By means of a delicate Casella anemometer I have been enabled to ascertain the direction of the air from the wind sail, and

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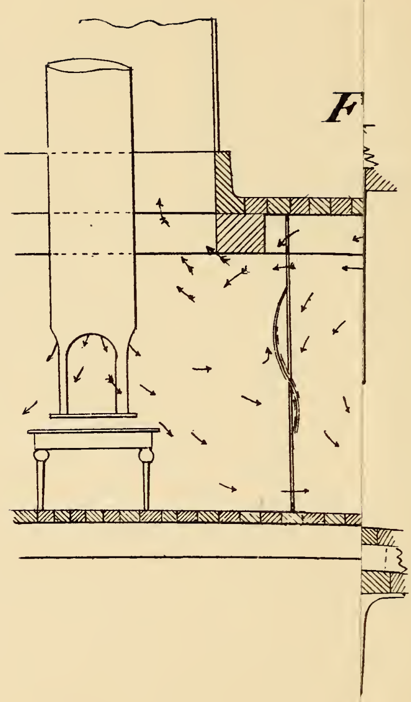

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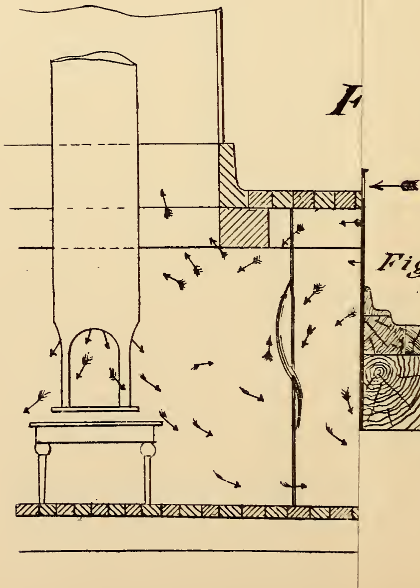
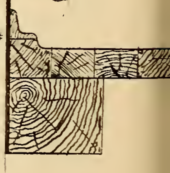


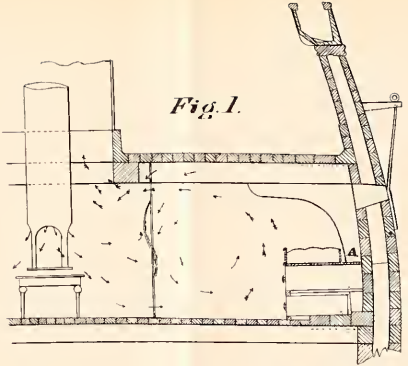
Fig. 8.



have indicated it in fig. 1 by arrows. The anemometer used is so sensitive that its vane moves freely in a current of air that will not perceptibly deflect the flame of a candle. The curtain was kept open both at the top and bottom, in order to permit a free circulation of the air, and when the air port was closed there could not be found the slightest current above the berth. On one occasion, when the air port was closed, the observations, which were taken immediately on rising, showed 19.036 parts of carbonic acid in a specimen of air taken from behind the berth, (at A, fig. 1,) while a volume of air from the wind sails of 11,016 cubic feet per hour was flowing through the room, in the path indicated by the arrows. On another occasion, with the air port open, similar observations showed 6.662 parts of carbonic acid while 21,600 cubic feet of air per hour flowed through the room, in the paths indicated by the arrows in fig 2. The analyses for carbonic acid were made by Assistant Surgeon George Arthur, who employed Park's method, while the air currents were measured by the writer.

It is evident from the above experiments that the exhalations should be breathed into the air current, or that we must sleep in a draught if we would breathe pure air. In order to supply an outlet for the vitiated air which accumulates behind the berths, Dr. Arthur proposes an exhaust tube, as shown in fig. 3. With natural ventilation or with a forced blast there can be no doubt that Dr. Arthur's tube would be of great value in exhausting the impure air, and with ventilation by mechanical aspiration this tube would reverse its action and supply the fresh air. From the direction taken by the currents, as delineated in fig. 1, it would appear that Arthur's tube is well located, and also that the exhaust tubes on board the Richmond, which are above and back of the berths, are properly placed, but I think we should not lose sight of the necessity of quickly drying the decks, and I would, therefore, recommend placing the exhaust openings in the floor, and depend on Arthur's tubes as inlets. From the experiments referred to above, made with the air port closed, and again with it open, we have another evidence that the air currents take the direction of least resistance; and in order to uniformly disseminate the pure air, and to insure its reaching every part of the ship, we must remove the impure gases from the points where they are generated, and it is obvious that we must employ some system of aspiration, either natural or artificial.

Quantity of Air.—Not many years ago it was believed that the quantity of air needed to keep an apartment wholesome was merely equal to the amount exhaled, which is about 12 cubic feet per hour;



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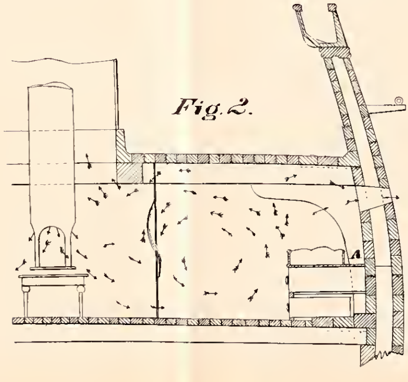


Fig. 2.

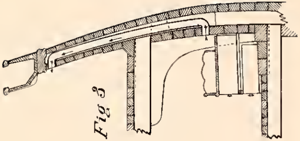


Fig 3

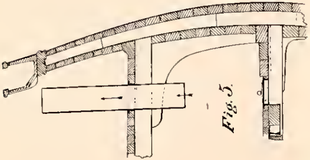
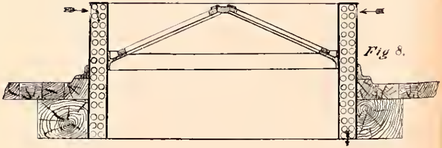


Fig. 5.



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Quantity of Air.—Not many years ago it was believed that the quantity of air needed to keep an apartment wholesome was merely equal to the amount exhaled, which is about 12 cubic feet per hour;

but a set of experiments to determine the quantity necessary to dilute the carbonic acid exhaled by the lungs to something near the normal quantity, indicated that 3 cubic feet per minute, or 180 per hour, would be sufficient. Later observers concluded that the necessary amount would be that which would dissolve the aqueous vapor expelled by the lungs and skin, thus preventing the hygrometric condition of the air from rising too far above that of the surrounding atmosphere, and that 5 cubic feet per minute, or 300 per hour, would be sufficient.

Assuming that the air admitted upon the berth deck of a ship be mixed by at once diluting the carbonic acid present, we will find it an easy matter to calculate what the volume of that air shall be. Let us take an example from the steam sloop Vandalia, one of our latest ships, and one that is considered to have relatively good ventilation. On the 12th of August, 1879, Assistant Surgeon Geo. Arthur collected a jar of air from the middle of the ward room, and by subsequent analysis (by Park's method,) found it to contain 6.983 parts of carbonic acid in 10,000 parts. At the same date and hour, the writer found the quantity of air (as measured by a Casella anemometer,) admitted into the ward room to be 96,780 cubic feet per hour or 9,678 cubic feet for each of the ten occupants, which is vastly more than is necessary to keep the air at the purity found by Dr. Arthur. Assuming the air supplied by the wind sails to contain 4 parts of CO_2 per 10,000, which is the normal, we have all the data necessary to ascertain the volume of air essential to keep the air at the above mentioned purity.

Let Q = the quantity of air, in cubic feet, to be supplied.
n = the number of men, - - - - 10
a = the number of cubic feet of carbonic acid exhaled per hour per man, - - - - 0.686
b = the fraction of carbonic acid normal to the atmosphere, - - - - - 0.0004
c = the fraction of carbonic acid found in the air of the apartment, - - - 0.0006983

Then

$$na+Qb = (Q+na)\,c$$

$$na+Qb = Qc+nac$$

$$na-nac = Q\,(c-b)$$

$$Q = \frac{na-nac}{c-b} \qquad (1)$$

And, substituting the numerical value for the letters in the formula, we have

$$\frac{(10 \times 0.686)-(10 \times 0.686 \times 0.0006983)}{0.0006983-0.0004} = 22,981,$$

or $\frac{22,981}{10} = 2,298$ cubic feet of air per hour per man. Roscoe made this calculation by a different method, and, as it has been adopted by Dr. Wetherell and others, it will not be out of place to verify the above results by comparison with Roscoe's method.

Let V represent the volume of air free from carbonic acid that would be required, and $a =$ the fraction which the impurity of the air (0.04 per cent.) is of the limit of the impurity in the mixture (0.06983 per cent.), and let $Q =$ the volume of normal air required.

Then $Q = V + Va + Va^2 + Va^3 \times Va^4 + \quad . \quad Va^n \quad .$ (2)

It will be sufficient to calculate the first five terms only of this expression:

$$0.06983 : 99.93017 :: 6.86 : V = 9,817$$

$$a = \frac{0.04}{0.06983} = 0.5728$$

$$a^2 = 0.328$$

$$a^3 = 0.188$$

$$a^4 = 0.107$$

$$\begin{aligned} V &= 9817 \\ Va &= 5623 \\ Va^2 &= 3219 \\ Va^3 &= 1845 \\ Va^4 &= 1050 \\ \hline Q &= 21554 \end{aligned}$$

or 2,155.4 cubic feet per hour per man, instead of 2,298 as found by formula (1), though it will agree nearer and nearer the farther it is followed.

But let us compare the volume of air actually admitted with the quantity essential to preserve the purity mentioned. We find that a Casella anemometer, purchased from respectable dealers in Philadelphia, (Queen & Co.), verified by the U. S. Signal Office in Washington, indicated the enormous quantity of 96,780 cubic feet per hour, or $\left(\frac{96,780}{22,981} =\right)$ 4.2 times the necessary amount. Had this 96,780 cubic feet of air per hour mingled with and diluted the carbonic acid in its passage through the ward room, Dr. Arthur would have found very much less of that poisonous gas in his analyses. By transposing from formula (1) we can calculate the number of parts of CO_2 he would have found, viz.

$$c = \frac{na + bQ}{Q + na} \quad . \quad . \quad . \quad (3)$$

and by substituting the numerical values we will have $\left(\frac{10 \times 0.686 + 96780 \times 0.0004}{96780 + 10.686} = \right) 4.71$ parts in 10,000, or an atmosphere almost as pure as that outside the ship.

It may be now asked, why does not this great quantity of air whirled into the ship through the wind sails accomplish its object? The question has been answered many times. The air, after leaving the wind sails, takes the shortest and most direct route to the nearest outlet and escapes, and all the benefit we derive from it is by the eddies it creates; and the only way to utilize it is by causing it either to enter in a larger number of smaller jets or, what is equivalent, cause it to escape through a large number of separate openings.

Now let us take an example from the berth deck of the Vandalia, the place where the sailors are berthed. Their hammocks are swung side by side, from the beams over head, leaving an unobstructed passage for the air underneath, and there are no such bulk heads between them as between the officers' berths. An observation was taken at 5.30 A. M. Sept. 22, 1879, a few minutes after the men left their hammocks. The wind was on the port bow, and was blowing at the rate of 600 feet per minute. There were 5 air ports open on the weather side, through which the mean velocity of the air entering was 125 feet per minute, and, as each air port presented an area of 0.306 square feet, the aggregate volume of air entering through them was, in cubic feet per hour, 11,475. There were two wind sails in use at this part of the deck, each presenting an area of 2.75 square feet through which the mean velocity of the wind was 287.5 feet per minute, making, in cubic feet per hour, 94,875, or a total of (11,475+94,875 =) 106,350.

There had been berthed there that night 130 men, so that the air per man was $\left(\frac{106,350}{130} = \right) 818$ cubic feet per hour. The carbonic acid found on this occasion by Dr. Arthur was 13.18 parts in 10,000, whereas, had the fresh air been thoroughly mixed with the air on the deck, it would have been (from formula 3)

$$\left(\frac{na + Qb}{Q + na} = \frac{130 \times 0.686 + 106,350 \times 0.0004}{130 \times 0.068 + 106,350} = \right) 12$$

parts in 10,000, or a quantity very much nearer the theoretical than that found in the ward room.

In order to ventilate the berth deck of this fine sloop by means of

an exhaust fan, we have first to determine the size of the fan, conduits and registers. There are 120 established billets on the berth deck for hammocks, besides rooms for four warrant officers, steerage capacity for twelve officers, and ward room quarters for twelve more, making a total of 148 persons. Allowing each one 2,298 feet of air per hour, we will require $(2298 \times 148 =)$ 340,104 cubic feet.

We find exhaust fans advertised by the Boston Blower Co., (fig. 4,) capable of producing a velocity of 75 feet per second,* which is 270,000 feet per hour.

The area of a conduit or of the exhaust fan opening to pass 340,104 cubic feet per hour at 270,000 linear feet per hour is $\left(\frac{340{,}104}{270{,}000} =\right) 1.26$ square feet, or $(1.26 \times 144 =)$ 181.44 square inches, or a tube having a diameter of 15¼ inches, nearly. The nearest regular merchantable size to this would be the 45-inch exhaust fan, the opening of which is 15¼ inches diameter. It would be advisable to place the fan as near the deck as practicable, having four branch pipes, one running forward on each side of the deck, and one running aft on each side.

The diameter of the main conduit, if of circular section, would be equal to the induction opening of the fan, i. e. 15¼ inches, (and if of square section it would be 13½ inches,) while the four branch openings would be 6¾ inches each. In practice it would be necessary to increase the four branch pipes to 8½-in. diameter, to prevent the resistance of surface friction and *contracted vein* from becoming greater than in the main pipe.

In order to discharge the same quantity of air from each state room, the registers, or openings, into the main conduit from these rooms would necessarily increase in size the farther they were placed from the fan. The size of openings cannot be calculated without experimental data, and I can find no record of any experiment on similar tubes with a number of openings. There would, however, be no mechanical difficulty involved in this, for registers or inlet valves would necessarily be placed at each opening, and after the fan had been put in use the valves could be graduated and stops put at the limit.

Now let us consider the value of the air shafts with which our vessels are sometimes provided, and also the air jacket that surrounds the smoke pipes of all our steamers.

In July, 1879, the Vandalia towed a section of dry dock from Chester, Pa., to Pensacola, Fla., which so retarded the vessel's speed that

* At 1,400 revolutions per minute.

no draught was perceptible in the wind sails, and the temperature on the berth deck rose to an uncomfortable height; the surgeon's test for carbonic acid indicated a larger amount of that gas than usual. The men could not sleep well in their hammocks, and many of them were permitted to sleep on the spar deck under the cover of the awnings; the firemen and coal heavers were becoming enervated, and two of them fainted at their work, from exhaustion. We then improvised a chimney on each side of the deck, by removing a deck plate and placing over the hole one of the coal shutes, as shown in figure 5. These shutes are cylindrical in form, are made of rolled plate iron, and are 15¼ inches internal diameter and 8 feet in height. Owing to the interference of the hammock netting we were compelled to lower the shute 3 feet below the surface of the deck, leaving us an exposed height of only 5 feet, and only this height is effective for draught. When these shutes were secured in position it was found that a light breeze abeam would cause a downward current in the lee chimney and a strong upward current in the one on the weather side, no doubt from the deflection of the air from the slanting surface of the hammock netting. But when there was no perceptible wind there was an upcast draught in the coal shute as well as in the permanent chimneys over the engine room, ward room and shaft alley.

On the 2d of August I suspended a thermometer inside the coal shute, and another near the top, in the external air, the former indicating 87.6° Fahrn.—the mean of a number of observations—and the latter 84°, the difference being 3.6 degrees: and a number of readings of the anemometer gave a corrected mean velocity of 46.92 feet per minute, which gave a total volume of 3,570 cubic feet of air discharged per hour from this simple and inexpensive device. The volume of air discharged from a chimney varies according to the difference of weight of the air inside and of that outside. This was, I believe, discovered by Montgolfier, the inventor of the balloon. He taught that the draught was equal to the velocity of a body which had fallen through a space equal to the difference of the height of two columns of air of the same weight (and of equal base) the one being of the temperature inside the chimney and the other that of the external atmosphere.

Let H = the height of chimney, in feet.

H' = the height of the heated column of air of equal weight.

T = the temperature inside the chimney.

t = the temperature of the external air.

A cubic foot of air expands 0.0020276 times its volume, on being warmed one degree, so that we have

$$H'-H = H\ (T-t)\ 0.0020276 \quad . \quad . \qquad (4)$$

and, consequently, the theoretic velocity will be

$$V = \sqrt{2gH\ (T-t)\ 0.0020276} \quad . \quad . \quad . \qquad (5)$$

By substituting numbers for the letters in formula (5) we will find a velocity of 1.533 feet per second, or sufficient to have discharged 6,954 cubic feet per hour, instead of 3,570, as determined by the anemometer. The result recorded is the mean of a number of observations taken when the wind was not blowing, and, as far as could be seen, they were not influenced by any other cause than the difference of temperature between the outside and inside of the chimney. The velocity of the air through the chimney can never reach the theoretic value, for the reason that it is retarded not only by the resistance of the surface of the chimney but by the *contracted vein*, and also by any object upon the lower deck which in any way obstructs the passage of the air to the chimney. I had spent much time in experimenting upon the velocities of air through iron shafts, under varying conditions, with a view to making an empyrical formula for practical purposes, when I found in General Morin's *Etudes sur la Ventilation*, that that distinguished engineer employed a separate experimental value (K) for a co-efficient for each and every shaft. Representing this quantity by K, we have for the correct velocity for our chimney

$$V' = K\sqrt{2gH\ (T-t)\ 0.0020276} \quad . \quad . \qquad (6)$$

and in this case the value of K becomes 0.5101.

There are six places in the deck of the Vandalia where these chimneys can be fixed, whereby ($6 \times .3570 =$) 21,420 cubic feet of air per hour would be discharged from the sleeping quarters of the men, not only purifying the air on the deck, but reducing its temperature. At the after end of the ward room of the Vandalia there is a copper ventilator 12 inches in diameter and 9½ feet in height. Its lower end is contracted by adjacent wood work, its upper end by an elaborate hood, and near the middle of the shaft it is further reduced in area by a metallic grating. During cool weather, when the ward room was kept much warmer than the external air, the current was quite strong in this shaft. The wind did not seem to increase the velocity of the air, nor did it retard it, owing probably to the construction of the covering. It was effective even in warm weather. On one occasion, while lying in the harbor of Aspinwall, (15th September, 1879,) when the temperature on deck was 80° and in the ward room 86°, I meas-

ured a velocity of 1.405 feet per second, which amounted to a discharge of nearly 4,000 cubic feet of air per hour. This ventilator is over the pantry, and is doubly valuable in removing the odors of that apartment from the ward room. Situated near the ventilator is a similar one which connects with the bread room. As the bread room is ceiled in, and no air can get in to supply the ventilator, it is of no use.

The amount of air exhausted from over the boilers by means of the smoke pipe jacket is considerable. On the 2d December I made an experiment on the Vandalia's jacket (figure 6) the result of which I record:

Date of experiment, . . .	December 2d, 1879.
Total height of the jacket, in feet, . . .	$14\frac{1}{2}$
Height of jacket above the dead plate, in feet, . . .	5
Depth of jacket below the dead plate, in feet, . .	$9\frac{1}{2}$
Net area (A) of cross section of the jacket, in square feet,	10.78
Net area between the outer edge of the jacket and the inner edge of the canopy, ...	9.05
Temperature (T) on deck, ...	44
Temperature (T′) around the jacket, between decks,	88.25
Mean temperature (T″) surrounding the jacket $\left(\frac{9.5\,T'+5T}{14.5}=\right)$	73
Mean temperature inside the jacket, . . .	87.41
Mean measured velocity of escaping air, in feet, per second,	3.736

By substituting this experimental velocity in formula (6), and by transposing and dividing, we have 0.716 for the value of K. In this case it must be remembered that not only the velocity is greater, but the surface, as compared with the area of the ventilator, is enormously larger than in the former example.

The contraction of the outlet of the jacket, by too small diameter of the canopy, probably retards the outflow still more. Yet, under the disadvantageous circumstances, there were in the experiment recorded 145,000 cubic feet of air discharged per hour, or sufficient to ventilate for 63 men. The standing part of the present smoke pipe is 23 feet, and there is no reason why the jacket can not be made the same height. Nor is there any reason why it should not be made $8\frac{1}{2}$ feet in diameter, or nearly the whole width of the boiler hatch, as shown in figure 7.

Assuming the conditions to exist as in the previous example, this arrangement would discharge 300,000 cubic feet per hour, or sufficient ventilation for 130 men—the entire number billeted upon the berth deck.

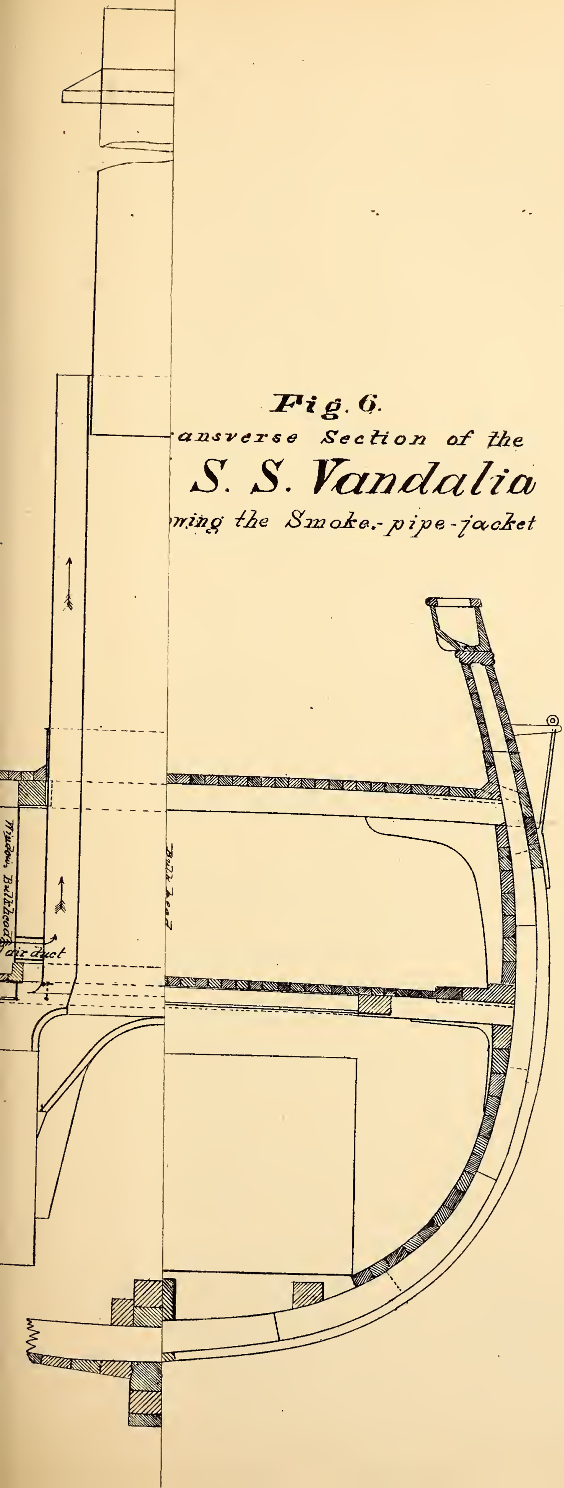

Fig. 6.
ansverse Section of the
S. S. Vandalia
wing the Smoke-pipe-jacket

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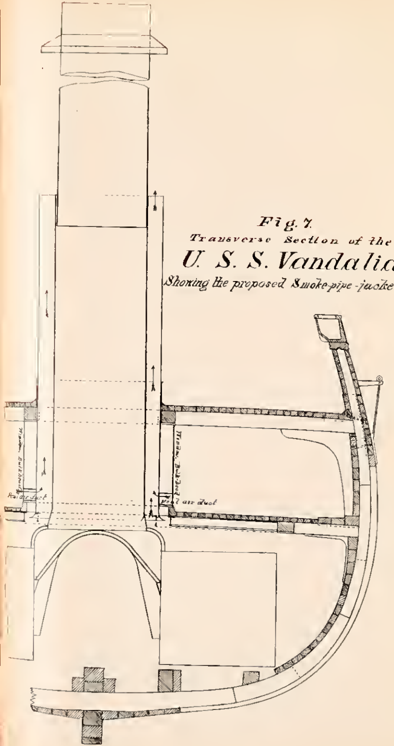

Fig. 7.
Transverse Section of the
U. S. S. Vandalia,
Showing the proposed Smoke-pipe-jacket.

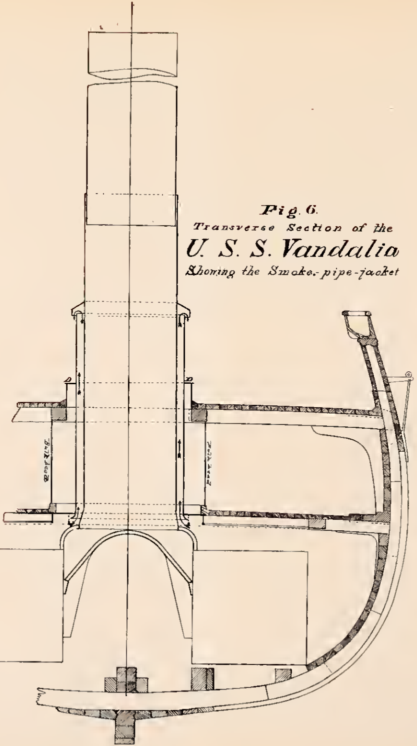

Fig. 6.
Transverse Section of the
U. S. S. Vandalia
Showing the Smoke-pipe-jacket

The only objection that now presents itself to me is that the amount of air drawn into the jacket from around the boilers might rob the furnaces and seriously impede the rate of combustion, and, consequently, the potential power of the engine. In meeting this objection we may introduce air ducts to the jacket, from the berth deck, and then, if necessary, contract the area of the bottom of the jacket.

WARMING.—During cold weather we keep our ships warm partly by steam radiators, and partly by excluding the external air. The opening of doors or sky lights, or the temporary removal of hatch hoods, creates considerable inconvenience to those quartered near them, while those who are located near the steam coils complain of excessive heat. With the whole ship closed up, and but little motion in the air, we find it uncomfortably cold near the sides of the ship and uncomfortably warm near the heaters. On board the Trenton the heaters in the ward room contained nearly one square foot of surface to each 100 cubic feet of space in that apartment, and were sufficient to keep the mean temperature in the ward room at 74°, with the hatches wide open, while the external atmosphere was 30°. Nearly the same condition obtained on board the Vandalia. The area of a heater of this kind designed for ship warming may be safely proportioned by dividing the volume of the apartment, in cubic feet, by 100.

In order to uniformly disseminate heat throughout a vessel we must either have a large number of small heaters, spaced at regular intervals, or warm the air as it enters the ship. The former would encumber the floor, while the latter would require aspirating machinery to make it a success.

Early in December last, when the vessel was warmed by the radiators, and when the sky lights and hatches were closed, Dr. Arthur found 19 parts of CO_2 in the air of the ward room, which, from formula (1), would indicate that only 456.4 cubic feet of air per hour for each of the 12 occupants passed through the ward room. This is about one-fifth of the necessary amount. It appears, then, that, if we supply 2,300 feet per hour to each of the 12 men in that apartment, and if we wish to warm the air as it enters, we must increase the surface of the heaters five fold.

For example, the wardroom contains 7,417 cubic feet, and multiplying this by .05 we have 370.85 square feet required for the heater. The hatch coamings are of iron, and the sky light of the ward room is 5 feet square, in the clear. By putting 2 coils of $1\frac{1}{4}$-inch pipe inside that coaming, as in fig. 8, employing 16 full convolutions in each, we

can get 200 feet, or half the necessary area in the single sky light. It will then be necessary to encase the whole coil with sheet iron, except at the bottom, and to place inlet holes near the top. It must be added that this form of heater would not work unless an in-current of air be created by mechanism in the ship. It would work admirably on board the Richmond.

I have given fig. 8 merely as an example, and wish to state that I would not, if designing the heaters, place the entire surface in a single hatch, because the velocity of heated air issuing would be too great. General Morin recommends that the velocity of the incoming air should not exceed $1\frac{2}{3}$ feet per second. It would be more convenient to place a coil in each of the three hatches; and, by having the casing large enough to leave 2 inches on each side of the pipe we could get sufficient area to reduce the velocity to about $2\frac{2}{3}$ feet per second when the fans were inducing the full amount of air. Of course this could be diminished at any time by slowing down the fan, and that would only be necessary when persons were compelled to sit near the warm air inlet. The advantage of saving the floor room, now encumbered by steam heaters, is of some importance, while the convenience of being able to sit under a sky light to read or write and at the same time enjoy a pleasant temperature will make life on board ship more agreeable.

Moisture.—The hygrometric condition of the atmosphere we inhabit is of almost as much importance as its temperature, or its freedom from poisonous or deleterious gases.

In cold weather the atmosphere is proportionately free from moisture, hence the true time to supply moisture is not when it is warm, as in spring or summer, but in winter, when it is warmed artificially. After securing a sufficient quantity of air its temperature and moisture are of next importance. If cold air be heated in summer by natural causes it absorbs a proportionate share of moisture from the lakes, rivers and the ground, or from the sea, and thus reaches us in a salubrious condition. On the contrary, if cold and dry air be artificially warmed without receiving additional moisture its increased power to absorb moisture renders it offensive.

"Warmed air," says Prof. Wyman, "without increased moisture, is; apt to produce unpleasant sensations in the chest, which are often attributed to too great heat." In cities there is more than four times as much water held in the air at 75° than at 32°, though I doubt if the difference is so great at sea.

Dry air is an active absorbent of water. Many a shower which is

precipitated from a cloud never reaches the ground, and the north winds of Europe, robbed of their moisture in passing over the chilled surfaces of the Alps, are dry and arid when they reach the coast of Africa, where they are re-warmed to a degree far exceeding the dew point, the result of which is the rainless region of the great Sahara.

The relative humidity of the atmosphere is expressed in "percentages of the saturation of the air for moisture at any given temperature." If a cubic foot of air, saturated with moisture, be warmed, its humidity is reduced from one hundred to, say, seventy; and, conversely, if a cubic foot of air whose relative humidity is seventy be chilled, its humidity is increased up to its saturation, when it becomes again one hundred.

For example, on board the Vandalia, on the coast of Syria, in July, 1878, the observed temperature of the dry bulb thermometer was 84°, that of the wet bulb 63°, difference, 21°. This corresponds respectively to 12.376 and 6.361 grains of moisture in the air, or a relative humidity of

$$\left(\frac{6.361 \times 100}{12.376} =\right) 51.3.$$

From Dr. Charles M. Wetherell's report on the ventilation of the Capitol, I copy the following:

TABLE OF THE MEAN PROPORTION OF AQUEOUS VAPORS IN THE AIR OF HALLE, GERMANY.

	Tension in millimeters of the aqueous vapor, measuring absolute humidity.	Relative humidity.
January	4.509	85.0
February	4.749	79.9
March	5.107	76.4
April	6.247	71.4
May	7.836	69.1
June	10.843	69.7
July	11.626	66.5
August	10.701	61.0
September	9.560	72.8
October	7.868	78.9
November	5.644	85.3
December	5.599	86.2

"Thus," continues the Doctor, "as the tension, or absolute humidity, increases with the year, the relative humidity decreases."

The following table* expresses in Troy grains, the weight of vapor

* Guyot No. X, Smithsonian Meteorological Tables.

contained in a cubic foot of saturated air at the different temperatures of Fahrenheit:

TABLE SHOWING THE NUMBER OF GRAINS OF WATER CONTAINED IN A CUBIC FOOT OF AIR AT DIFFERENT TEMPERATURES.

Temperature of the air.	Vapor in grains.	Temperature of the air.	Vapor in grains.	Temperature of the air.	Vapor in grains.	Temperature of the air.	Vapor in grains.
0	0.545	59	5.566	72	8.521	85	12.756
5	0.678	60	5.756	73	8.797	86	13.146
10	0.841	61	5.952	74	9.081	87	13.546
20	1.298	62	6.154	75	9.372	88	13.957
30	1.968	63	6.361	76	9.670	89	14.378
32	2.126	64	6.575	77	9.977	90	14.810
40	2.862	65	6.795	78	10.292	91	15.254
45	3.426	66	7.021	79	10.616	92	15.709
50	4.089	67	7.253	80	10.949	93	16.176
55	4.860	68	7.493	81	11.291	94	16.654
56	5.028	69	7.739	82	11.643	95	17.145
57	5.202	70	7.992	83	12.005	96	17.648
58	5.381	71	8.252	84	12.376	97	18.164

In the West Indies, the relative humidity on board ship frequently reaches 100°, even in summer time; and, during rain storms, when the hatches are covered, the atmosphere below is not only mephitic from the respirations of the men, but is saturated with moisture: there can then be no absorption by the air, consequently the heat is oppressive. But the rapidity of evaporation from the body depends upon the low relative humidity of the air at high temperature and of the action of currents of air. With too great dryness of air, particularly at higher temperatures, and especially in strong draughts, a greater degree of evaporation than is consistent with health will ensue. There is then a happy mean in the relative humidity which is consistent with health and comfort, and for the determination of this point we must look to the surgeons of the Navy, who are now pursuing the subject with increased interest and vigor.

To supply the necessary hydration to the air is an easy matter, and requires but a simple device—an ordinary stop-cock. I do not think water could be used very successfully on board ship, as the spray would necessarily require space that could not be spared; but a jet of steam would do the work most effectively and economically. The experiments, on the absorption of gases by water, made at Mare Island in 1870,* demonstrated very satisfactorily the rapidity with which gases

* Journal of the Franklin Inst., Jan., 1872.

and water, or more particularly air and steam, combine as the steam is in the act of condensing.

Table compiled from the atmospheric observations on board three similar vessels, during the same period, two of them having natural ventilation and the third having exhaust fans.

			Hartford.	Pensacola.	Richmond.
10 P. M. Observations of January, 1879.	Height of Barometer in inches of mercury,		29.92	30.01	30.13
	Temperatures. *Spar Deck.*	Dry bulb,	68.75	78.00	60.70
		Wet bulb,	61.72	77.10	56.80
	Temperatures. *Berth Deck.*	Dry bulb,	73.20	83.48	66.56
		Wet bulb,	66.90	79.37	57.74
	Temperatures. Difference between the spar deck and berth deck,		6.45	5.48	5.86
	Relative humidity on the spar deck,		90.25	94.47	89.02
	Relative humidity on the berth deck,		91.89	94.65	88.68
	Carbonic acid in the air of the berth deck in 10,000ths,		30.30	8.19	10.09
10 P. M. Observations of February, 1879.	Height of Barometer in inches of mercury,		29.90	30.15	29.95
	Temperatures. *Spar Deck.*	Dry bulb,	71.15	70.25	48.00
		Wet bulb,	65.35	67.40	45.00
	Temperatures. *Berth Deck.*	Dry bulb,	74.17	77.45	53.60
		Wet bulb,	68.38	72.80	48.20
	Temperatures. Difference between the spar deck and berth deck,		3.02	7.20	5.60
	Relative humidity on the spar deck,		91.22	92.83	83.92
	Relative humidity on the berth deck,		92.21	93.37	85.24
	Carbonic acid in the air of the berth deck in 10,000ths,		10.25	7.676*	10.80
10 P. M. Observations of March, 1879.	Height of the Barometer in inches of mercury,		30.02	30.05	30.10
	Temperatures. *Spar Deck.*	Dry bulb,	69.44	62.17	65.10
		Wet bulb,	62.78	59.32	59.00
	Temperatures. *Berth Deck.*	Dry bulb,	76.60	72.82	72.84
		Wet bulb,	66.43	67.01	66.20
	Temperatures. Difference between the spar deck and berth deck,		7.16	10.65	7.74
	Relative humidity on the spar deck,		90.50	97.59	89.30
	Relative humidity on the berth deck,		91.39	92.02	91.60
	Carbonic acid in the air of the berth deck, in 10,000ths,		9.193	6.745	17.54
				* 2.76 on the spar deck 27th of February.	

The Fire Room. The temperature of the fire rooms of our ships frequently rises to 120°, and in some cases has reached 150°. This heat is communicated to that part of the berth deck adjacent to the fire room, and that part of the berth deck which surrounds the boiler hatch is particularly uncomfortable as sleeping quarters. You have only to press your hand against one of the panes of glass in the bulk-head to satisfy yourself of the amount of heat that must pass through. The bulk head proper, the coamings and the deck, being of thick wood, conduct the heat very much slower than the thin glass, but, having a great capacity for heat, retain it a long time after the fires are extinguished.

The length of the boiler hatch is considerable; and, to preserve the strength of the vessel as much as possible, the deck beams are carried across the hatch, reducing the area considerably, and not only diminishing the supply of air to the fires but hindering the escape of the

heated air and gases, for both up and down currents exist in the boiler hatches. To correct these evils I would suggest that double windows be substituted for the single panes now used in the bulk-head of the boiler hatches, which will reduce the conduction very much. The wood work of the deck over the boiler as well as inside the bulk head may be covered with a non-conductor such as asbestos. The smoke pipe jacket may be made of greater diameter and height, (fig. 7,) and the deck beams might be made of iron instead of wood, which would reduce their size and obstruction to currents very much. A practice antagonistic to ventilation is to cover the boiler hatch immediately around the smoke pipe with a thick cast iron dead plate, which prevents the escape of the hot air which always surrounds the smoke pipe. In designing these things we have kept in a beaten path, and it is now time to amplify them. Fig. 6 is a transverse section of the Vandalia, showing the uptakes of the boiler, the smoke pipe and the jacket, as they exist. At D the dead plate is shown which supports the jacket. The arrows indicate the natural direction of the current of air. On the top of the jacket (fig. 6) is shown the canopy, or umbrella, as it is sometimes called, the object of which is to keep out the rain, and also to give a finish to the jacket; but as this device retards the outflow of the heated air it needs to be modified.

Fig. 7 represents a similar section of the same vessel, showing the jacket enlarged, as I would propose it, with the canopy riveted to the moving part of the pipe, instead of the standing part, as in fig. 6, and the canopy is so placed as to cover the jacket only when the pipe is lowered.

The Mechanical Means of Ventilation already introduced into the Navy.—*Beaumont's Exhaust Fan.*—The first attempt at ventilation in the Navy, by any kind of machinery that I have any knowledge of, was made by Lieut. (now commodore) J. C. Beaumont, in 1853.

Lieut. Beaumont's arrangement was an exhaust fan, and was applied exclusively to the magazines of vessels. In 1856 he constructed one, in the New York navy yard, for the frigate Wabash (to which vessel he was attached), and it worked "to the entire satisfaction of all hands." It was used during the entire cruise, and received a favorable mention in a paper by Medical Director R. T. Maccoun, in 1858. "My ventilator," continues Beaumont, "was in use on board the Wabash as late as 1863, having been used on board that vessel during three successive cruises."

Beaumont's ventilator was an ordinary rotary, centrifugal fan, but he connected the pipe to the center opening, making it an exhaust fan, and by running the pipe into the magazine he kept the air there quite fresh, requiring but two men to turn it. The following is a copy of the official correspondence concerning Beaumont's ventilator:

NAVY DEPARTMENT, 10 May, 1853.

CAPTAIN H. PAULDING:

Your letter of the 5 inst., with a report of the cost of the air pump made under the direction of Lieut. J. C. Beaumont has been received. You will be pleased to have the air pump examined by a competent board of officers, and its merits tested, and report to the Bureau. Yours, &c.,

W. B. SHUBRICK.
Chief of Bureau.

NAVY YARD, WASHINGTON, May 11, 1853.

GENTLEMEN:

You will be pleased to examine the air pump made in this yard, under the direction of Lieut. J. C. Beaumont, and have its merits tested, and report the result to me in writing.

Very Respectfully,
H. PAULDING, *Commandant.*

Com'd'r S. H. POWELL,
Lieut. E. G. TILTON,
Master C. V. MORRIS.

NAVY YARD, WASHINGTON, 12 May, 1853.

SIR:

In obedience to your order of the 11th inst. we have examined the air pump made in this yard, under the direction of Lieut. J. C. Beaumont. We believe it will be very useful in our men-of-war and merchant vessels, and to answer all the purposes for which it is intended. Very Respectfully, &c.,

S. H. POWELL, *Com'd'r.*
E. G. TILTON, *Lieut.*
C. V. MORRIS, *Master.*

Beaumont's system was then adopted by the Navy Department, but in erecting the machines the pipe leading to the magazine was led, no doubt by mistake, from the discharge side of the fan, making it send a blast into the magazine instead of exhausting the foul air from that apartment, thus making the machine do the opposite to what the inventor intended. Workmen continued to erect and connect the magazine ventilators on the forced blast principle, and Beaumont's invention, system and labors were soon forgotten.

The Monitor.—The next essay was in the little iron clad steamer Monitor. During her encounter with the Merrimac the crew suffered from

the effects of ill ventilation, and the vessel was subsequently taken to Washington, where the Chief of the Bureau of Steam Engineering, (Mr. Isherwood,) improvised an apparatus which worked very well. He caused a rotary blower, (a Dimpfel blower, I think,) which was in store at the yard, to be put on board the vessel, as near amidships as possible, leading pipes from the after half of the vessel to the suction side of the blower, and discharging the air into the forward half of the ship. He built his conduits of light sheet iron (galvanized, I believe,) and had small registers at intervals for the admission and discharge of air.

The Later Monitors.—In the Monitor ships that followed the original vessel by that name a forced blast was employed. It is the same method as employed in the Capitol at Washington, and in large buildings generally. Why Mr. Erricsson, the distinguished engineer who designed those vessels, preferred that system I am not prepared to say; and, though I prefer the opposite system, I am glad to acknowledge that the ventilation of those vessels is measurably good.

The Despatch.—In 1874, the Secretary of the Navy, having made a voyage on board the Despatch, found the air in the cabin very bad. He accordingly gave the Engineer-in-Chief of the Navy an order to devise some means to ventilate the cabins. Mr. W. W. Wood was then Chief of the Bureau of Steam Engineering. He called Chief Engineer Robie and myself in consultation in this matter, and we visited the Despatch which was then lying at the Navy Yard. We found on board a rotary blower for creating an artificial draught in the boilers, so that we had only to arrange for conduits under the floor, connecting to the suction side of the blower, (a rotary fan,) and to provide registers which we placed in the floor. This arrangement has worked very well, changing the air rapidly without making a strong draught.

The Richmond.—In March, 1878, the Secretary of the Navy appointed a board, consisting of medical inspector T. J. Turner, commander J. R. Bartlett, chief engineer David Smith, and constructor B. E. Fernald, "to examine and ascertain the best system of ventilation by mechanical means or otherwise," etc., etc.

The board recommended that the system of ventilation by aspiration be adopted, and that the most approved exhaust fans with independent engines be employed. This is essentially what had been done in the Monitor and in the Despatch, so that the Richmond is the third vessel in the Navy ventilated on that system. The Board explained

in their report a plan of the conduits, where they were to lead, *et cetera*, and where and how they should receive and discharge the air. The Richmond was designated to receive the mechanical ventilation, and it was placed on board at the Boston Navy Yard during the year 1878. The exhaust fans required were larger, I believe, than any regular merchantable size, and the patentee, Mr. Sturtevant, designed and built those two especially for the Richmond, with the engines bolted to the frames of the fans, and connected directly to the fan shafts. The chief engineer of the Richmond reports favorably on the smooth working of the apparatus, and states that while they are in use there is no smell of bilge water gases, and that the washed decks are soon dried by the rapidly passing currents of air. But the analysis of the air of the berth deck, from specimens collected at 10 P. M., while the men are berthed, as reported by the surgeon of the vessel, indicate very little improvement over the Hartford, (a sister ship) for the same period, and the air on board the Richmond was not as pure as that on board the Pensacola (a sister ship) during the same period.

The purity of the external atmosphere, of course, has a great deal to do with this, as has, also, the opening of the air ports, and the employment of wind sails. I think the better method of testing the efficiency of the Richmond's ventilation would be to institute a series of experiments on board that vessel, taking a large number of specimens of the air simultaneously, for analysis, both with and without the exhaust fans in operation and with the men in their hammocks ; and it would be well at the same time to analyze the external atmosphere for carbonic acid.

In 1876 chief engineers Newell, Robie and Dungan were appointed to devise the ventilating machinery for the Miantonomah, which vessel was then being rebuilt. The ventilating machinery of the original vessel was designed by chief engineer Isherwood, and consisted of rotary blowers situated under the turrets and driven by steam engines through the intervention of belts. The blowers were not arranged to exhaust. On the 29 June, 1876, the Messrs. Newell, Robie and Dungan submitted their report, which was adopted.

The system devised and now in use on board that vessel is novel, inasmuch as the fans are reversible, i. e., by shifting the valves in the blower openings the fan changes from a blower to an exhaust fan. These fans, which are 7 feet in diameter, are intended to be run up to 500 revolutions per minute, with a capacity of 20,000 cubic feet of air for each, or 40,000 cubic feet for the two machines.

They are driven by direct acting engines, bolted to the blower frames, (fig. 9,) * and are arranged under the turrets (fig. 10).

The duty of the blower will be to supply air to the furnaces, as well is to ventilate the ship. The furnaces are intended to burn 5,000 pounds of coal per hour, which will require ($5{,}000 \times 24 \times 0.075 =$) 9,000 cubic feet of air. Deducting this from the capacity of the fans at 500 revolutions, $40{,}000 \times 60 = 2{,}400{,}000$ we will have (2,400, 000—9,000 =) 2,391,000 cubic feet left. The complement is intended to consist of 34 officers and 285 men, or a total of 319 people: therefore the amount of air allowed is $(\frac{2{,}391{,}000}{319}) = 7{,}495$ cubic feet each individual. The engine power to drive these blowers up to 500 revolutions per minute is more than ample.

The CHAIRMAN:—When it is proposed to consider the various methods proposed for the ventilation of ships the forms of apparatus can be grouped for the purposes of study under three classes:

1st. Those that take the air out, or act on the Vacuum principle;

2d. Those that force the air in, acting on the Plenum principle; and

3d. A class composed of a mixture in varying degrees of the first and second classes. These are here considered in the opinion of your chairman to be grouped in the order of their frequency, usefulness and efficiency.

It is not proposed to consider at this time the necessity that exists for pure air on ship-board—air at least of the purity of that on the spar deck—nor to show by scientific mathematical demonstration the quantity required by the individual or demanded of masses of men, considering the surroundings when in enclosed spaces, nor to demonstrate to you from statistics the disease producing influence of impure air; for it is known to you all that the necessity for pure air is the constant iteration of every sanitary observer. Very slow has been the progress in the direction of practial application of the means for securing proper ventilation below the spar deck, although, as I shall show, the appliances proposed are numerous.

Of the first class of apparatus those that take the air out of a vessel are the most numerous as well as the most efficient. The removal of a volume of foul air is followed immediately by a volume of fresh air, impelled by the *vis-a-tergo* of the air, almost always a constant dependent, of course, upon barometic pressure.

It follows in this method that the mean change from a static (i. e. the air below deck) to a dynamic (i. e. the external air) condition makes the static head almost a dynamic one, and so merges this class into the second, or that class of apparatus which forces the air into a vessel.

This class has always a *vis-a-fronte* element to deal with, which will vary according to circumstances from a zero of resistance until even P (pressure) will = R (resistance) and the ventilation = 0.

These remarks are applicable to air circulating in tubes. The element of friction of the air in conduits has not here been considered. Those who are interested in such subjects are referred to the work of Peclet.

Of the third class there are too few, and reference will be made to them hereafter.

Under the first class are to be grouped exhaust fans, bellows, tubular and the automatic systems.

* From the report of the Engineer-in-Chief-for 1879.

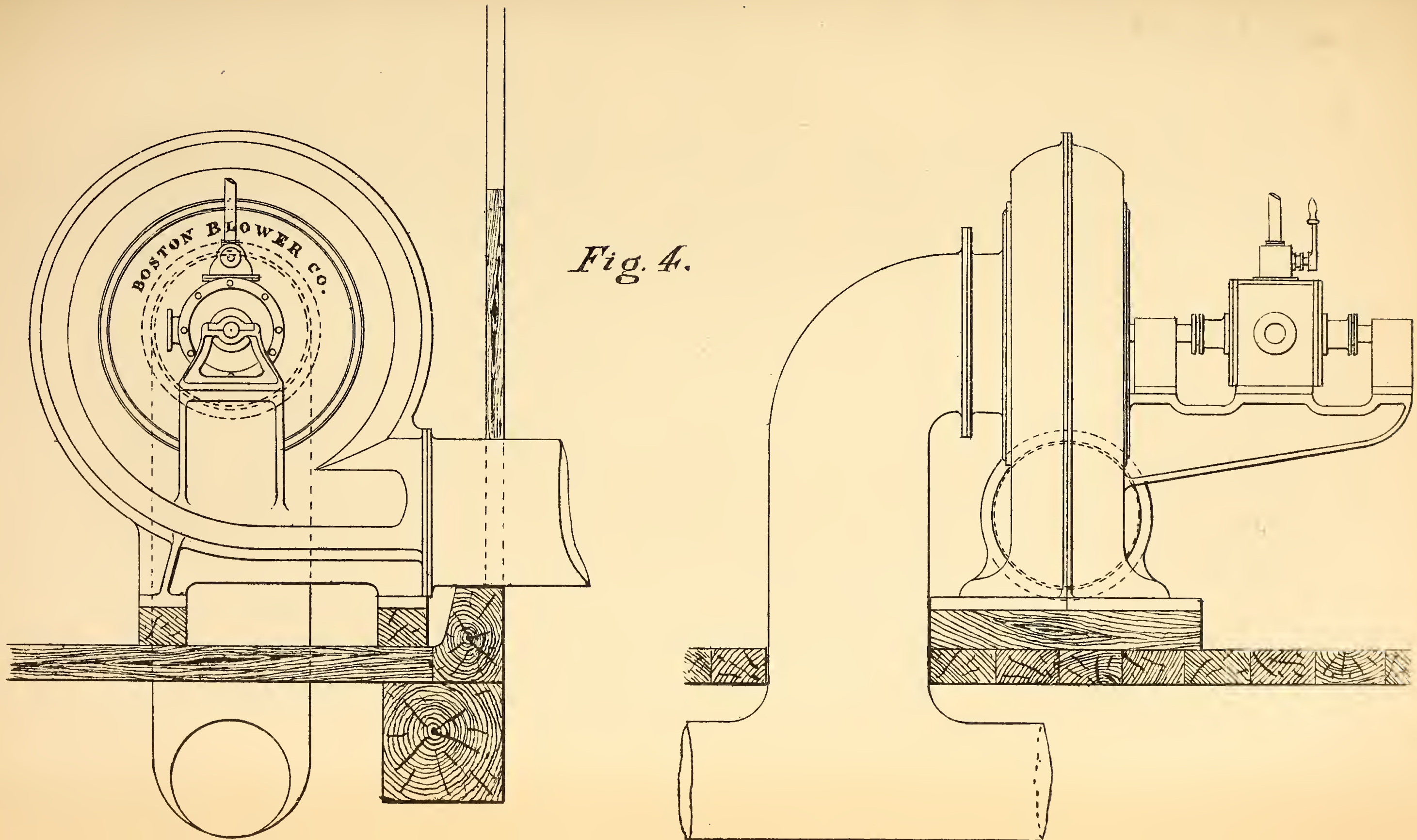

Fig. 4.

Under the second class the means used are, windsails, cowls, shafts et cetera.

And under the third class are to be placed the various fans reversible in action so as to act on either the vacuum or plenum principle, air-ports, et cetera.

I may here make the statement that the presence of a hatch does not exert much influence in an apartment otherwise closed.

Under such conditions there is about as much ventilation as in an uncorked bottle, for it has been stated by an eminent scientific ship builder that "the influence of an ordinary hatch to an otherwise closed hold is not felt much beyond a radius of eleven feet."

To those members of the Institute desiring to pursue the subject I respectfully offer this short résumé of authorities who have proposed methods for ship ventilation, or adopted suggestions of others having direct bearing upon this matter.

Agricoca—De Re Metallica—describes a mechanical apparatus for ventilating mines by injecting air with a rotatory fan, thus anticipating DeSagulier, Commodore Beaumont, and Brindjonc apparatus for ships.

In 1664 Dr. Henshaw, in his book called "Oerochalinos" published in Dublin, adopted one of Boyle's speculations, using a bellows to pump air in or out of a room. This was an anticipation of Commodore Barron's patent in 1835 for pumping the air out of a vessel by means of a smith's bellows.

In 1723 De Sagulier invented his wheel; and in 1741 Hales invented his "Ship's lungs," which in some measure resembles the apparatus of Henshaw.

At this same date comes the persistent, undaunted brewer, Samuel Fulton, assisted by his friend Dr. Mead, with his Thermo-ventilating apparatus,

Sutton published an "Historical account of a new method of extracting air from ships," which, with slight alteration of dates, would almost apply to the present time. In 1741, also, Sir Martin Triewald, a Swedish engineer, invented a machine to draw bad air from under the decks of the Swedish ships blockading St. Petersburg, and in 1742 his method was adopted by the French. I have not been able to obtain a description of this apparatus.

Of the French inventors, Du Monceau, Wittig and Wazon have suggested Thermo-ventilators. Damboise, Nouahier and Giffard propose cowls. DeCante (1870) suggests a method by compressed air. Of the others proposing means for securing the ventilation of vessels, I may mention Villiers, Kerauden, Brindejonc, Iouchon, Simon Defaix, Peyre, Ichiele and Williams, Poisenille (1846), Mondesir (1869) and Beaumaoir (1875).

To these already mentioned of English inventors must be added, Boyle and Arnott, whose method with variations, the principle remaining the same, has found its exponent in the hollow masts of the Spartan. Edmunds, 1865, by aspirating tubes; Dr. J. D. MacDonald, Prof. Naval Hygiene at Netley, Dr. Harry Leach, and the Napier system, as it is called, which the speaker of this evening modified in some particulars, in 1873.

Our own countrymen have not been idle in this direction, Commodore Barron, in 1835, McDonald 1841, Knight, 1847, Emerson, 1848, Robinson, 1850 and 1854, Bulkley, 1850, Sexton and Ennis, 1851, Thompson, '54, Bahr, '55, Knecht, '56—'58, Covel, '64, Burnett, Wells, and Woodward in '65, Wheeler, '67, Vanderbilt, '69, Sampson, '71, A. W. Thompson, '73, Jones, '76, Keating and Yaum in '78, nor must I omit the apparatus of Sir J. Liston Foulis in 1879, nor the cowl of Dr. Owens, U.S.N. nor Dr. Gibbs, U.S.N., modified wind-sail.

Of the Automatic variety of apparatus I may mention those of Thiers and Roddy 1871—1877, Delano U.S.N., '78, and Norton 79.

Of the inventors of modified air ports there must be noticed Sinclair 1864, Fernald, U.S.N. '77, Wilson, U.S.N. '79.

It is said that chief engineer J. W. King proposed a plan for ventilating

vessels in 1859, and chief engineer Isherwood has reported (1879) upon a plan proposed by D. C. Green, Esq., of N. Y.

As to the system of mechanical ventilation in the vessels of the monitor variety it is too well known to you all to demand more than this recognition.

The tendency at the present time is almost entirely towards the methods of the first class—extracting the air from the vessel, and in the course of some observation and a good deal more study, I give my adhesion, under the usual reservations upon scientific matters, to those methods.

One more statement in conclusion. To-day I have reason to know that two of our vessels are well ventilated—the Richmond and Lancaster. Of my share in this advance it does not become me to speak. I have the satisfaction, however, of knowing that there has been secured to some of my mess and ship mates, and I trust in the future will be secured to all my fellow-officers, the extinction of the remembrance of the foul and "stuffy" atmosphere of a berth deck by a liberal supply of pure air. One side of the naval sanitary triangle has been drawn—Ventilation—the other two, cleanliness and dryness, must soon be limned. When completed, health and its attendant comfort, as elements of an increased efficiency, are secure.

Medical Inspector GIBBS. I fully agree with the main feature of the instructive address to which we have listened this evening, and hope that the practical points may be adopted in our service, as fast as vessels are built or repaired. That we are sadly behind in our labors, in securing the practical advantages of ventilation in our ships of war is a most humiliating and painful fact. Having already written and labored somewhat extensively in this field I will confine myself to supplementing the speaker's remarks by describing the peculiarities of the fire-room hatch of H. M. Ship "Volage", which I visited on the south Atlantic station.

This hatch, between the berth and spar decks, was unincumbered with bulk heads, and the spar deck hatch was dedicated to aiding the ventilation in this part of the ship. In order to describe it intelligibly, the fire room hatch on the berth deck may be imagined to be divided into three parts. The central part comprised about one half of the area of the whole hatch, and, of course, included the smoke pipe etc. The two ends of the hatch, comprising about the other half of the hatch, were open spaces. The central half was covered with iron, sloping from a point about on a level with the spar deck, down to the quadrangular coaming, where it was secured. In fact this covering resembled an inverted hopper with the smoke pipe passing up through its centre. In this situation there was no obstruction to the passage of air through the spar deck of the hatch, and one half of the corresponding berth deck hatch was open to the descending current, where an upward current was forced beneath this hopper arrangement around the smoke pipe.

The officers of the ship informed me that there was never any annoyance experienced on the berth deck on account of the escape there of gases, ashes etc. The automatic ventilation of ships, I would add, by any aspirating device which we now possess, depending upon the force of winds or waves, has not, in my experience, been marked by any satisfactory result; and I would urge in the name of every hour I have lived in a vessel of war, and of every page I have read, endorsed by every conclusion I have reached in much reflection upon this subject, that a ship shall never be commissioned which is not provided with such a system of mechanical ventilation as now exists in the Richmond, or its equivalent.

Lieut. J. T. SULLIVAN: I am familiar with several types of automatic ventilators, but there is one form which I have had in use at my home for some time, and in studying its usefulness there I have been led to think that it might be applied with equal success on board ship. The ventilating apparatus or "cap" consists of four principal pieces; the dome, collar, band and tube. The collar encircles the upper extremity of the tube, and while

rising above the tube increases its diameter, becoming bell shaped. The dome has a diameter across its mouth or base equal to the greatest diameter of the collar, and when in place it is supported a short distance above and directly over the collar, leaving an opening all the way around between them. The band is somewhat broader than this opening and of greater diameter than the collar, so that in position it encircles the opening but does not come in contact with the main structure except at the points where it is secured.

In operation the "cap" works as an aspirator. and the external air currents, no matter in which direction they move, whether vertically, diagonally or horizontally, produce a tendency to vacuum in the tube, and consequently an upward and outflowing current. This process continues as long as there is any agitation of the external air, and the velocity of the exhaust current is increased as the wind increases, Applied to an apartment, its tendency to exhaust the air creates the desired circulation.

The correct principle of ventilation being to supply means for lifting or pumping the impure air out, as then fresh air will take its place, it would seem that the device described is well adapted to accomplish this process. Fitted to a vessel, in suitable sizes for the different locations, they would occupy, and with proper connections, they would insure an almost continuous circulation through its holes, bilges, store rooms and apartments. In selecting situations for them, advantage can be taken of their power to act whether they are placed right side up, up side down or sidewise; and for this reason they could be run along underneath the hammock rail, on the outside of the ship, and project only a few inches. These would serve to ventilate the holds, bilges, *et cetera*, while others of greater capacity could be distributed about the decks, and one of sufficient size to cap the smoke stack would do good service, not only in the process of ventilation and in exciting a strong draft for the fire, but in protecting the interior of the smoke stack and its dependencies from the weather.

P. A. Eng. Roelker: Mr. Chairman, I wish to call attention to that portion of Mr. Baird's paper which gives an account of experiments made by him on the velocity of air currents in ventilating shafts temporarily fitted to openings in the deck. These experiments show how large a quantity of air may be discharged through such improvised air ducts, or by making use of the annular space between the chimney and its outer casing, as proposed by Mr. Baird, when the temperature below decks exceeds by but a few degrees the temperature of the outside air. Such means of ventilation are, of course, purely auxiliary, and are not intended to take the place of systematic mechanical ventilation; but, in the absence of the latter, means may be found in nearly every vessel for improvising temporary ventilating shafts which will exhaust large quantities of the vitiated air below decks. Since the majority of our naval vessels will remain. necessarily, without mechanical ventilation, for years to come, it is to be hoped that the facts presented by Mr. Baird will induce others to apply in a similar manner the means at hand to the ventilation of our vessels, and I have no doubt that Mr. Baird will feel rewarded for his labors if the interesting paper read by him to-night produces this immediate practical result.

Lieutenant Tanner: It will, perhaps, be of interest to those present if I give a short account of my own experience with ventilators in sea going ships. When I took command of the Pacific mail steamer City of Peking, I found that she had been fitted with ventilating apparatus which extended to all parts of the ship except the main passenger saloons, which, being light and well up above the water, where air could circulate naturally, were considered not to require artificial ventilation. The draught was furnished by large blowers in the fire rooms, connected to circulating pipes, having at proper intervals small ports fitted with shutters. Particular attention had been paid to the ventilation of the cargo and passenger decks; the latter requiring a very frequent change of air, owing to the number of Chinese

that were transported each trip. On my arrival in Yokohama on my first trip I found a couple of Italian merchants who were in great trouble with regard to the transportation of a heavy invoice of silk-worm eggs. Hitherto the Pacific Mail company had refused to take this sort of freight, on account of the risk of losing a great part of it on the long passage to San Francisco. It is absolutely necessary that silk-worm eggs shall be kept in a cool place, where air can circulate freely about them; otherwise, if the temperature rises above a certain point, the eggs will hatch and the cocoons are spoiled. Having tested the ventilating apparatus thoroughly on the trip, I was very confident that it fully answered all that could be required of it. I therefore made overtures to the merchants, and succeeded in underbidding rival lines, and secured the cargo, which was valued at over half a million of dollars. This cargo I transported with absolute safety to San Francisco. Every morning on my round of inspection through the ship I would start the blowers and open the connections on the cargo deck, and in twenty minutes I could bring down the temperature 10°. It was only necessary to ventilate for about ten minutes three or four times in the twenty-four hours, and the temperature of my cargo would be kept at a constant point. Thus in one trip this apparatus paid a dozen times over the cost of putting it in the vessel. The Chinese passengers were frequently very much annoyed by the draught when their bunks happened to be in the vicinity of the ventilating ports, and, as they could not close the shutters, they resorted to stuffing their hats or clothing into the ports. The draught was so strong that no amount of jamming would hold their things in position, and every thing they put in would be drawn straight to the fire-room. Showers of hats, pantaloons and shirts were not infrequent in the stoke hole. Notwithstanding the airy position of the passenger saloons, the lack of proper ventilation was readily noticeable at sea. Passing from one of the ventilated apartments to the saloon, its "stuffiness" was quite appreciable, although, compared with the apartments of our men-of-war, these saloons were extremely well ventilated.

Lieutenant Very: In going over H. M. ironclad Dreadnought, I was especially struck with the excellence of the ventilating apparatus, which was apparently of the same type as that mentioned by Lieut. Tanner. The circulating pipes ran along under the shelf pieces of the main deck so as to be just above the head, and in the state rooms just over the bunks. The ports, of which there was one to each room besides a number elsewhere, throughout the storerooms, engine rooms, berth deck and holds, were closed by shutters, so that the draught at any one place could be regulated. Another feature noticeable on this ship was the absence of engine room bulkheads. The heat from engine and fire rooms was forcibly *drawn* straight up through the uptake jacket apparently, at any rate it could not distribute itself about the decks. I noticed this same feature on the Russian ironclad frigate Minin, and I also remember that whilst a midshipman on the Asiatic squadron I commented on the absence of fire and engine room bulkheads on the French ironclad Belliqueuse, remarking that it must be very hot on the berth deck and in the steerages, owing to the escape of hot air. I was corrected by one of the French officers, who told me that on the contrary the deck was better ventilated. This of course was not due to the absence of the bulk head, but to the arrangement overhead by which the hot air was drawn straight up, taking with it the vitiated atmosphere below decks. With our present system of fire room ventilation, cold air is forced down the ventilators and rushes immediately to the fires, leaving the vitiated air to grow and spread itself throughout the ship. Bulkheads are of but little service, as the heat is refracted from their outer surface and vitiates what little fresh air there may be circulating. As for wind-sails, they are simply a God-send to the officer who is able to point the muzzle into his stateroom door. Beyond a small radius their effects are so diminished as to amount to almost nothing.

P. A. Eng. Baird: I have had some experience in automatic ventilators, but have never seen the exact device sketched by Mr. Sullivan. We had a very smoky galley pipe on board the Trenton, and it was effectually cured by an aspirating hood which I made on the principle of the air injector which I had previously patented for my distilling apparatus, and which is probably well known to all the gentlemen present. So far as the history of the principles of ventilation are concerned, and to whom the original invention is due, I must admit that I was not well posted, and have, therefore, to thank our chairman for his able chronological arrangements of the dates of those inventions. My part in this matter commenced in 1863, and has been the part of an engineer and not that of an inventor. I have not been able to find recorded the experiments of anybody, except myself, upon the velocities due to difference of temperature in the smoke pipe jacket, nor has any person, so far as I can find, ever attempted to combine the carbonic acid analyses taken on ship board with the experimental draught of the wind-sails, and to put the same to any practical use. Nor is there published, to my knowledge, any data which will guide our mechanics in the proportioning of exhaust fans and tubes for ships. I have viewed this problem from an engineering stand point, and have sought to put it in a practical shape. The paper I wrote on this subject in 1873 (*vide* Sanitary and Medical Report III, Bureau of Medicine and Surgery for 1873 and 1874, and also the Report of the Secretary of the Navy for 1873.) has been favorably received by the officers of the Navy, and I do not hesitate to say that the ventilating machinery on board the Richmond is an indifferent imitation of that proposed by myself.

BOSTON BRANCH.

April 30th, 1880.

Com'dr O. A. Batcheller U. S. N., in the chair.

THE WANT OF DOCKING FACILITIES IN OUR NAVY YARDS.

By Civil Eng. U. S. G. White U. S. N.

Mr. Chairman, and Gentlemen :–

If there is any one thing in which we are deficient in our navy yard appointments it is in the matter of docks. We have not to-day a navy yard at which it can be said that there are any docking facilities.

We have at Boston, New York and Norfolk one stone dry dock each ; at Kittery there is an old and cumbersome lifting dock, as also one at Mare Island. Each of these docks is in bad condition and it was but a short time since that the Mare Island dock failed with a foreign man-of-war, very nearly producing disastrous results. There is now building for the Pensacola yard an iron, floating, sectional dock, two sections being already at the yard. This work being new is probably in good working order and is also, probably, supplied with such appliances as modern requirements may have suggested.

At the yard now building at League Island there are contemplated numerous stone dry docks, and also a lifting dock with marine railways, but it is very doubtful whether any means will be provided for the docking of a ship in such a near future as to interest any one here present. The same may be said of the dockage embraced in the proposed plan of development of the station at New London Conn.

Of all systems of docking it is conceded that the stone dock is the best. Although costing more in the first place, it possesses the advantage of greatest economy of maintenance, while, once within it, a ship is subjected to less strain. The most marked disadvantage is that a very limited space is provided in which to work, and during the heated term the men working in the lower part of the structure suffer somewhat from the heat, being almost entirely cut off from any air that may be stirring. Again a stone dock is limited in its capacity ; but as it is not probable that in the future naval vessels will have the great length which

is being given to the merchant marine this is not so great a disadvantage. Circumstances might arise, however, in which we might be called upon to dock a vessel of greater length.

The superintendent of the Leyland line of steamers instructed one of their captains to learn whether or not there were facilities for docking one of their ships in Boston should she meet with any mishap requiring her to go into dock. After making inquiries at the different docks in Boston he called upon me in company with a friend to learn if our dock would take one of their ships, the shortest one of the company's steamers being three hundred ninety-two feet between perpendiculars. It is needless to say that it could not be docked. The sectional docks are unlimited in capacity, but the great requirement, rigidity, is not found. Although means are now employed to obviate this trouble to a very marked extent, still there is much danger to be apprehended from the strains which are liable to be thrown upon a ship, arising from emptying the different sections unequally, and the greater the number of sections the greater the danger to be apprehended.

The balance dock is, next to the dry dock, the least open to the objections offered to the sectional dock, but still it is a cumbersome affair and, like all lifting docks, the cost of maintenance is great. The addition of railways upon which to haul the ship from any one of the floating docks I think injurious. It is almost an impossibility to place a road on a bed sufficiently rigid and level to haul a vessel upon without doing more or less damage to her, although this is the plan proposed by no less eminent an engineer than Captain Eads for transferring ships across the isthmus of Panama. I do not propose to set myself up in opposition to Captain Eads, but were I the owner of a good ship I would want to see how his plan worked with some other person's vessels before I risked mine ; with small vessels there is no reason why they should not be lifted and run upon a railway for storage or repairs, but for large vessels I must say, that I do think there is danger of racking and twisting them.

There is a system of dockage now in use at Nicolaieff in the Russian dock yard, which, in my opinion, is the best yet devised. It possesses the advantage that at almost a nominal cost it can be extended as far as the requirements of the service may dictate. This system consists of a lifting dock of peculiar mechanism and a series of piling, arranged in clusters, upon which the vessel is deposited. The dock is a large rectangular box thoroughly trussed and braced, to which is rigidly attached a number of pontoons also completely trussed; the entire structure being built so as to make it as rigid as possible. On the

side of the rectangular box opposite the pontoons is placed a counterpoise very ingeniously designed. The pontoons are so arranged that the dock can be hauled in against the piling, the pontoons passing in between the clusters of piles. In docking a vessel, a cradle very strongly braced to add to the rigidity of the structure is placed upon the dock, and the whole is sunk; the ship is then hauled over the dock and placed in the proper position, the pumps are started, the pontoons emptied and the vessel lifted, the dock is hauled into the piling, the pontoons slowly filled, causing the dock to sink leaving the vessel in its cradle resting on the piles, and in position for any repairs or work to be done. When a ship is ready to be put afloat the dock is sunk, and hauled in under her, the pontoons emptied, the vessel lifted from the piles, and her cradle hauled out, the dock sunk, leaving the vessel afloat. When a vessel is built she is started and completed in a cradle, and, when she is ready to put afloat the dock is called into use, and she is floated as above described, thus avoiding all danger of straining her in launching,—should it become necessary to dock a vessel when all the space is occupied, all that is required to accommodate her is to drive more piles, brace and cap them, and they are ready for use.

Mr. Clarke, the engineer who built the dock, took every precaution to make the risk to a vessel, while being lifted, a minimum. In testing this dock a vessel was lifted and floated twice in a violent gale of wind, and the action was in every way highly satisfactory. By this dock and its piling the Russian Government obtained, for an expenditure of £200,000 sterling, facilities equal to twenty ordinary stone docks, each one of which would have cost at least, $ 1,000,000.

For the purpose of laying up vessels not required for service this system is very superior, both the time necessary to lift and deposit a vessel and also that consumed in floating her again being very small, while space on the water-front, not otherwise required, can be prepared and used for this purpose.

I will now lay before the institute an idea for which I claim originality, not in the means used but in the application thereof. A dam of peculiar construction has been in use for some years, in France, in streams which at periods require facilities for slack water navigation. Our government is about finishing one in the Ohio river at Pittsburg. The peculiar feature of this dam is that when there is a good boating stage of water, and there is no need of the locks for the passage of vessels it lies flat on the bottom of the river; but when the water becomes so low that navigation is impeded the dam is raised up in short sections, and the water held back, and vessels pass through the locks,

I think only two men are required to set the dam up, a section at a time; when there is a rise in the river the top of the dam buoys up, the props are pulled out from the sockets in the apron, and the whole structure is laid upon the bottom. This action is automatic.

While studying this dam and its working I conceived the idea of applying it to ship-yards for dockage purposes.

I have considered the plan in connection with a wet basin estimated for, located in the site now occupied as a timber basin, between the steam engineering machine shop and the construction buildings near the dry dock. The plan, as recommended to the Secretary of the Navy, contemplated the excavation of the site to a proper depth, I think thirty-one feet, with a lock, which, being connected with the pumps of the dry dock, could be used as a dock for such work as cleaning bottoms and making slight repairs.

To carry out my ideas I would pile a portion of this basin, if not the whole, and put in a heavy concrete floor; attached to this floor will be structures built on the principle of the dam, enclosing spaces suitable for landing vessels on the floor; there will be also cross dams allowing the use of a longer or shorter portion as needed. Ordinarily these dams will lie upon the bottom of the basin out of the way of any vessels to be moved from one part of the basin to another,

When it is necessary to expose the bottom of a vessel the following course will be pursued. She will be put in a cradle and taken to that part of the basin where she is to be landed, the sections of the dam enclosing the space will be raised and secured in place, the pumps will then be started; before the level of the water within the enclosure shall have been lowered sufficiently below that without to throw an under strain upon the structure the vessel will have been landed, and the introduction of shores will have commenced; and by the time the enclosure is pumped out the shoring will have been completed, and the vessel will then rest in perfect safety. I have not worked up the details of construction of the sides I would use. The material should be wood with copper fastenings, and the walls being double, so connected that when lying on the bottom they would come together, but when lifted into place they would be four or five feet apart, with internal toggled bracing which would come into play as bracing when, in raising the walls, they had almost reached the point at which they are to remain. Were I going to construct this work in a locality where the teredo abounds I should use iron, unless the experiments now being conducted by the Corps of Engineers of the Army show that the teredo does not attack wood which has been treated by the Thilmany process.

In that case I would prefer the wood, as more lasting. I propose soon to prepare detailed drawings of a work of this nature, and then I will be able to give an estimate of the cost. The estimated cost of the wet basin heretofore submitted for consideration is one million four hundred thousand dollars. I think with an additional expenditure of about one million dollars facilities for docking six vessels in the basin could be provided. Were a vessel docked as set forth there would be no more risk attending the operation than in putting her in a stone dock. The water in the basin being kept at a constant level, through the interposition of the lock, floating platforms and cranes could be used in carrying on the work. Before floating a vessel it would be necessary to thoroughly clean the floor and remove therefrom all chips and pieces which might in any way interfere with the raising or lowering the sections of the walls; for the same reason it would be necessary to allow no surface drainage to go into the basin with material to be deposited therein. With proper care I believe that such plan would, if carried out, prove highly satisfactory, both as to its action and cost of maintenance; and I would have no hesitation in recommending its adoption. As it would be an experiment I would suggest that it be tried with a single compartment at first, and then, if a success, additional compartments could be provided.

Leaving out of the question the class of docks to be constructed, there is no manner of doubt that a large increase of dockage is necessary. The idea of a naval ship-yard with facilities for docking but one vessel is ridiculous, and the very great inconvenience to which this condition of affairs would subject us in time of war is patent to all. Every yard in the service should be able to provide dockage for ten vessels; any variation from that number should be to increase rather than diminish it. There is no other element of dock-yard organization that possesses the importance of this one. Should a necessity arise throwing upon this yard double the amount of work it is now capable of doing everything could be provided and put in operation in thirty days, by simply preparing the beds for the tools, putting them in place, and throwing over them a temporary covering; but instead of being called upon to do any such thing we are prevented from working the yard to its full capacity by the want of docks in which to repair vessels.

In the plan laid down for the development of this yard, and from which there was to be no deviation, five stone docks were provided for. Why they were not built no one can tell, but the omission of four of the five was a very serious mistake on the part of the authorities having control at that time.

It is a trite saying—"in time of peace prepare for war"; and now that Congress is waking up to the condition of the service, and taking initiatory steps looking to the building up of a navy creditable to us as a nation, I think that one of the most important things requiring consideration is to put our yards in condition to maintain the navy in good order for war purposes. We are well provided with shops, machinery et cetera, and what we need is a large increase of dockage, so that we can work the yards to good and full effect.

Comd'r Sicard. I have been very much struck with the economy of the Russian dock, which seems in every way admirable, and especially in point of expense; the only serious cost would be that of preparing one caisson or floating platform. The part attached permanently to the shore should not be very expensive, and is capable of indefinite expansion. The dock to be made by raising and lowering gates (such as is used for dams on the Ohio river) seems sufficiently easy to arrange and could probably be made tight without difficulty.

Hon. R. B. Forbes. I have long entertained the idea that every naval station on the sea coast should have a place for the storage of iron-clads; almost every naval station has rivers emptying near it and it would be perfectly feasible, in my opinion, to utilize fresh water now running to waste in supplying basins, docks or locks or storing iron-clads. I am not ready nor am I competent to say exactly how this should be done; I leave that to engineers. Let me say however that as the sources from which the streams come are much higher than the proposed basins or docks, I can conceive of no mechanical difficulty to prevent carrying out the idea. It would be altogether a question of money, and it will naturally occur to every one that the cost of the docks, and of the supply of water, may be too great to warrant carrying it out.

Perhaps the simplest plan would be to construct a basin for the storage either dry or afloat of three large ships. In time of peace, when movements would be rare, the expense of maintenance would be small, and in action, even if large, the expense would be a secondary matter. I shall not take up your time further than to say that competent engineers may do well to make estimates of the cost and maintenance of the docks. They need not be of fine hammered granite, nor need they be monuments of architectural skill like the dock near by; with strong sea walls and gates they may, I fancy, be built very cheaply, the land being the chief cost.

Civil Eng. White. I would say in reply to Mr. Forbes's remarks on the subject of fresh water basins in which to lay up iron clad vessels that since I have been in the service I have been on two boards of engineers to lay out and prepare estimates for such works, one at Norfolk and the other at the New London station. The one at Norfolk covered twenty seven acres, the estimated cost being about one half million of dollars, including a lock five hundred feet long by eighty feet wide, and bringing water from the Dismal Swamp. The one at New London covered a space of seventeen acres, at an estimated cost of about four hundred thousand dollars. As a means for preserving iron clad vessels from the action of salt water, when not in service, I consider the Nicalaeiff system as the best plan now before the world.

Lieut. Bassett. Mr. Chairman. I move that the thanks of this Branch of the Naval Institute be tendered to Mr. White for his instructive paper.

The motion of Lieut. Bassett was adopted.

NEW YORK BRANCH.

May 20th, 1880.

Lieut. W. Mc.C. Little, U. S. N., in the chair.

THE NAVAL BRIGADE

By Lieut. John C. Soley, U. S. N.

Mr. Chairman and Gentlemen.

The term Naval Brigade, as you all know, is applied to the forces of a ship or ships which may be landed for operations on shore, and is composed of infantry and artillery, with their necessary accompaniments. This force may be used for a variety of purposes, but each one involves the possibility of fighting. To do this successfully it is necessary to have (1) organization, (2) skill in the use of weapons, (3) discipline. Beyond all question organization is the first essential. It assigns to each man his part in the great whole, it provides his food, his clothing and his ammunition, it prevents accidents and renders confusion almost impossible. Skill with weapons speaks for itself, and it is worthy of remark that this subject has lately received an impetus which is gratifying. In the matter of discipline and instruction we have the greatest difficulty to contend with. A dislike of infantry tactics, as it is called, is inherent in the sailor, principally on account of the unpractical way in which these exercises are generally conducted. It is quite possible however to make them interesting by making them so thoroughly practical that their usefulness will be readily comprehended. We must teach the men to think and to know the part that each one is to play in the war game ; we must make them realize that each man, by acting sensibly, can contribute to success, and that it is his duty to coöperate at all times : if we can do this we shall find that the sailor's qualities of activity, readiness in emergency, and his almost daily habit of facing danger will be the greatest aids in making him an efficient fighter when he is on shore.

I propose to give first, a concise history of the operations of the naval brigade in our service with the results obtained ; then a plan of

organization and a system of drill which will make our naval brigade efficient to day. I hope I shall be excused for introducing a great many details, but I do it because they will be found useful, and an officer does not always have the means at hand for obtaining them.

Before commencing I must apologize for presuming to lay down any rules of warfare to be followed, because I have no war experience myself. I can only say that I have consulted what are generally acknowledged to be the best authorities, and have united to their teachings my own experience in conducting these exercises as a matter of instruction and drill.

History. 1813. June 22. Defence of Craney island by a party of one hundred seamen and fifty marines under Lt. Neale of the Constitution.

1813. Oct. 23. The Essex, under Porter, at Nookahevah in the Marquesas, went in to refit, made a station, and engaged in wars with the natives.

1814. Aug. 17. The Adams, under Morris, having been injured by going ashore on the coast of Maine, and a squadron of the enemy approaching, she was taken up the Penobscot to Hampden and an attempt was made to protect her. Batteries were erected on the river bank, and the seamen and marines endeavored to beat off an attack, assisted by the local militia. The latter gave way, and the seamen, *being without muskets*, could make no effectual resistance. The ship was burnt and the men retreated.

1814. Aug. 24. Battle of Bladensburg. The only resistance of any account, made to the enemy's attacks in this battle, was made by the detachment under Captain Barney, of three hundred and seventy seamen and seventy eight marines from the Chesapeake flotilla. The militia gave way entirely.

1814. Aug. and Sept. Seamen and marines under Commodore Rodgers were constantly engaged during these two months in the Potomac and around Baltimore, partly in boats, but most of the time on shore or in forts. (In September occurred the battles of North Point and Fort Mc Henry). They were of course peculiarly fitted for this mixed service, and did good work.

In several small engagements on shore, on the lakes, the Navy gave valuable assistance to the troops.

1822. January. The Porpoise, Lt. Ramage, sent a force of forty men on shore on the north western coast of Cuba and broke up a depot of pirates, after a hot fight.

1823. April 16. * Captain Cassin, commanding the Fox and three other small vessels, landed his men near Cayo Blanco and had a running fight on shore with pirates. Their establishment of five houses was taken and burnt.

1823. July 22. † Attack on pirates near Cape Cruz by the Greyhound, Lt. Kearney, and the Beagle, Lt. Newton. Similar to Cassin's fight in April. Farragut commanded the landing party.

1832. Feb. 6. ‡ Attack on Quallah Battoo in Sumatra. This was an elaborate and extensive operation. Two hundred and fifty seamen and marines and a 6 pdr. were landed under command of Lt. Shubrick. 1st division, Lt. Pinkham, 2nd division, Lt. Hoff, 3d divsion, Lt. Ingersoll, howitzer, Master Totten, marines, Lt. Edson. Four forts taken by assault, and town burnt. This expedition was sent from the United States to punish the Malays for an assault on the American ship Friendship.

1840. July. Landing parties were sent ashore in the Fiji Islands on two different occasions, from the Vincennes and Penobscot in Wilkes' exploring expedition, to punish attacks of the natives. In the second landing the party met with considerable resistance from the natives, who were well armed. The stockade was captured and two towns were burnt.

1846—1848. War with Mexico. It must be remembered in looking at the naval character of the war with Mexico that it was entirely on one side. Mexico had no navy whatever and made no attempt to prosecute the war on the sea: consequently our navy was almost wholly occupied in coast and landing operations. Of course the main feature of the war was Scott's campaign between Vera Cruz and the city of Mexico: the army of invasion broke the power of the enemy, but the army never aimed at conquest of territory: and when the question of annexation came up it was settled largely on the basis of permanent conquest. These conquests, which were of so much importance in their bearing on the question of annexation, were almost wholly accomplished by the Navy. At the outbreak of hostilities, in June 1846, Commodore Sloat was in command of the squadron on the West Coast, and he sailed in the Savannah for Monterey, where he landed two hundred and fifty seamen and marines and took possession, while the

* Am. State Papers, Naval Affairs, 2, 240, 241.

† Am. State Papers, Naval Affairs, 2, 246.

‡ Cooper's Naval History—continuation p. 33.

Portsmouth did the same at San Francisco. He was relieved in July by Stockton, who determined to strike a sudden blow at Los Angeles, where the California legislature was in session, and which was defended by a force of about fifteen hundred men. He immediately issued a proclamation to the people of California, and organized a battalion of volunteers which he put under command of Col. Fremont, but this force did not participate in the capture of Los Angeles. He sailed southward to the port of San Pedro, which is thirty miles from Los Angeles, where he landed three hundred and fifty seamen and marines, with several 6-pdrs. and one 32-pdr. carronade. He then formed a camp and commenced drilling them, and it is worthy of note that he made no attempt to exact the same sort of discipline that is required in the army, but "they were directed to obey a few words of command such as, 'halt', 'march,' 'form line', 'form square', 'charge', and always to keep the same comrade on the right or left. In executing the necessary evolutions in which they were exercised, though all at first appeared confusion, yet every man soon took his proper place, and the most perfect order was immediately obtained." "They saw their Commodore sharing with them all their hardships, partaking their rations and their toils, marching side by side with them, always going ahead in the hour of danger, and they caught with inspiration the ardor which excited him."* The march was accomplished successfully, the enemy routed, and Los Angeles surrendered Aug. 13. It was left with a small garrison and Stockton returned to the north. Late in the fall it was retaken by the Mexicans, and they drove off the men landed at San Pedro which they also took. Stockton returned, took San Pedro and then went to San Diego from which place he determined to march again on Los Angeles distant one hundred and fifty miles. His force, this time, consisted of five hundred seamen and marines, sixty mounted riflemen, Kearney's sixty dismounted dragoons, one howitzer and six 6-pdrs. He started Dec. 29, fought two engagements, and Los Angeles surrendered Jan 10. Resistance was now at an end and a temporary civil government was established. When the time came to settle the conditions of peace the territory of the United States was increased by this immense district, comprising over six hundred and fifty thousand square miles. The conquest may be laid to the credit of Stockton and the Navy.

Other operations on the West Coast.—1846. September. Party

*Life of Stockton, p. 119 et seq.

landed from the Cyane, at San Blas, under Lt. Rowan, spiked guns, et cetera.

1847. September. Capt. Lavalette landed party at Guaymas to resist threatened attack of the place; enemy drew off.

1847. Oct. 1. Fight at Mulejè. Landing party of fifty seamen and marines from the Dale, under Lt. Craven.

1847. Nov. 11. *Capture of Mazatlan by landing party from Independence, Congress and Cyane, six hundred seamen and marines, five guns. No resistance. This was well organized. Commodore Shubrick commanded the squadron and superintended all the details. Mazatlan was occupied, civil government was established, and two hundred and fifty thousand dollars collected in five months.

1847. Nov. 17. Fight at Guaymas. Landing party of sixty-five seamen and marines, under Comdr. Selfridge; enemy defeated.

1847. Nov 19.
1848. Feb. 4—14. } † Gallant defence of San José by Lt. Heywood, with a small force of seamen and marines. Finally relieved by landing party from the Cyane, under Dupont, after a close engagement.

1848. Jan. 12. Landing party at San Blas, under Lieut. Chatard. Two guns captured.

Operations on the East Coast. 1846. May 8. Five hundred seamen and marines from the squadron under Capt. Gregory, landed and assisted in the defence of posts on the Rio Grande.

1846. Summer and fall. Tampico, Laguna, Frontera, all taken and occupied by landing parties.

1847. March 22-29. Bombardment of Vera Cruz. Principal execution done by the Naval Battery: a battalion of marines marched with the army to the City of Mexico.

1847. April 12. Capture of Tuspan. Landing party of fourteen hundred and ninety seamen and marines and four field guns, under Capt. S. L. Breese.

1847. June 15. Capture of Tobasco. Landing party of eleven hundred seamen and marines, with eleven field pieces under Commodore M. C. Perry. Fatiguing march, and severe engagements. Tobasco was occupied and the naval garrison was constantly engaged in fights with guerillas.

* Cooper's Naval History, Continuation pp. 71, 72.

† do do do do do 74-77.

It may be said that these were small affairs. So they were, in one sense, as compared with a modern pitched battle: but they represent the whole service performed by the Navy during the war, except blockade duty and transport duty. The results were very important and out of all proportion to the skirmishes that took place. All the seaport towns on both the east and west coasts were taken; the blockade of the coast was turned into an occupation, and at all the ports a naval government was organized, a naval officer appointed Collector of Customs, a tariff established and the whole custom's revenue of Mexico, for the time being, turned into the treasury of the United States.

1854. April 4. Combined English and American landing party at Shanghai to protect foreign residents. Sharp engagement with the Chinese.

1855. Summer. Landings and engagements at the Fiji Islands by parties from the John Adams.

During the war of secession landing parties were being constantly used, and did important service, both on the Mississippi and on the coast. It would take too much time to recount them all, and I shall only mention one which was the most instructive and at the same time the most important; and that was the landing at Fort Fisher. The details of this landing party are familiar to all. It was conceived in a spirit of gallantry and from a natural desire that the Navy should gain as many laurels as possible. But while the attack helped our land forces to victory it was most disastrous to the Navy. It failed, not merely because our men were opposed to disciplined troops, but because they were sent with inferior arms to fight against men who were behind intrenchments and who had the best weapons of the time. I will not enter into any details beyond giving extracts from the orders issued relative to the landing, and an extract from the report of the officer in command of the landing.

These extracts will sufficiently explain the failure. "The sailors will be armed with cutlasses, well sharpened, and with revolvers. When the signal is made to assault, the boats will pull around the stern of the monitors, and land right abreast of them and board the fort on the run in a seamanlike way. The marines will form in the rear and cover the sailors. * * * * *. He will first advance with a thin line of sappers, as soon as he can get a ditch deep enough for shelter, the marines will go in thin squads and occupy them. * * * * * * No move is to be made forward until the army charges, when the navy

is to assault the sea or southeast face of the work, going over with cutlasses drawn and revolvers in hand."*

Lt. Comdr. Breeze in his report says—"I can but attribute the failure of the assault to the absence of the marines from their position; as their fire would have enabled our boarders to use their pistols and cutlasses most effectually. By this I would imply the lack of proper organization, it being impossible in the short space of time, on account of throwing so many small squads of men from the different vessels together in one mass, lacking proper company organizations and wholly unacquainted with each other, to secure such organization." From a careful perusal of all the reports, it appears that the fault did not lie entirely with the marines, as they only shared the general panic. It seems almost too much to expect of men that they should march up to a fort in the face of a deliberate fire, with weapons which were only useful in a hand to hand conflict. The bayonet is superior to the cutlass always, because, as a double weapon, a man has more confidence, and properly drilled with the bayonet, even without ammunition, would be more than a match for men with cutlasses. Such a landing should only have been attempted when every detail of organization had been properly perfected, when companies and battalions were formed and with the men properly armed.

Operations since the war. 1867. June 13†. Hartford and Wyoming at Formosa. One hundred and eighty-one seamen and marines landed under Comdr. Belknap and Lt. Comdr. Mac Kenzie.

1868. Feb. 4‡. Assault at Hiogo by Japanese troops on foreign residents. Joint landing of naval forces present.

1868. Feb. 7. and 19‡. Two landings at Montevideo to protect foreign residents.

1868. April‡. Force landed from the Penobscot at Aspinwall.

1871. June 9. and 10§. Attack on Corean forts. Five hundred and forty-six seamen, one hundred marines, seven howitzers under Comdr. H. C. Blake.

1873. May. Landing at Panama. Two hundred seamen and marines, four guns, to protect the railway and American citizens.

1873. Sept. Landing at Panama. One hundred and thirty men and howitzers.

* Admiral Porter's order. Report of the Secretary of the Navy, 1865.

† Report of Secretary of the navy 1867.

‡ " " " 1868.

§ " " " 1871.

1873. Riot at Honolulu. Landing party of one hundred and fifty seamen and marines, and one gatling. This concludes a condensed history of the operations of the naval brigade in our service.

No one can fail to recognize the importance of the work it has performed, and, at the same time, it has been shown how success was always dependent on organization and drill. As long as our presence alone is sufficient to effect our purpose we may, to a certain extent, let them go, but if we are to fight we must not neglect the smallest point which can contribute to success.

ORGANIZATION. The basis of the organization of the landing party of each ship must be the number of men that can be carried by the boats without overloading them: having fixed upon the total, it is divided into infantry companies, howitzer and gatling crews, and the special details. The infantry companies are carried in the cutters and smaller boats: certain of the larger boats are fitted for howitzers and are generally used for that purpose, although it will be for the commanding officer to decide, in some cases, whether it is better to carry in the boat thirty men as infantry, with sixty rounds each, or a howitzer, whose locomotion is slow, which requires twenty men to manœuvre it, and which has at best only about forty rounds. The landing party is composed of—

One commanding officer, one aide, one officer commanding infantry, one officer commanding artillery. Marines—as many as are allowed. Infantry companies—two officers, forty men, each. Howitzer crews—one officer, twenty men, each. Gatling crews—one officer, twelve men, each. Signals—one officer, one quartermaster, four men, or less. Pioneers—one officer, carpenter, armorers and four men to each company. Field Hospital—one medical officer, one apothecary and four men. Provisions—one pay officer, one pay writer and one man for each company and crew. Ammunition—one gunner, one gunner's mate, one man to each company and crew, one master-at-arms, one ship's corporal, one ship's cook.

The men to form the companies are taken from the gun divisions, and the companies are officered from the divisions to which they belong. In the same way the howitzers are manned and officered from certain divisions, so that the men will find their comrades in drill next to them, and they will be under the officers to whose commands and instruction they are accustomed. The pioneers are selected from those who are used to the tools required, preferably from the carpenter's crew and engineer's force, with the armorer and his mates; the

ammunition, provision and hospital men from the powder division, and the signal men and gatling crew from the navigator's division.

In assigning the details to the boats, care must be taken to keep the men together under their own officers, the howitzer crews being placed in their proper boats and the companies assigned to any two boats that will carry them, with the commanding officer of the company in one boat and his junior in the other, and these two boats are kept together under all circumstances. The special details are assigned as is most convenient, but it is better to keep them together than to mix them up in the other boats. With regard to the marines it has long been the custom to distribute them as sitters in the different boats; this is open to two objections, first, it diminishes by so many the number of blue-jackets in the pulling boats where they are most useful, and it must demoralize the marines by separating them from their own officers, whom they must seek immediately after landing. This plan was adopted in former days because the marines were not taught to pull, and we had no other means of propulsion for the boats; but now we have steam launches which will generally carry the whole marine guard and they should unquestionably be placed in these boats where they will be under the command of their own officers.

When the landing parties of several ships are combined to form a naval brigade, the same thoroughness in detail must be observed. The infantry companies are united in battalions of four companies each and the howitzers into batteries of four guns each. For each battalion and battery a staff is assigned consisting of adjutant, ordnance officer, medical officer and pay officer, from those furnished by the different landing parties, so that the organization of each unit will be complete. These details should all be perfected before the boats leave their ships, and published to all, so that every officer and man will know his station and his own duty, and will know exactly all who are associated with him. Every boat which is used is numbered or lettered, the letters being used for howitzer boats and the numbers for the infantry and other boats. When organizing the force from a single ship the boats are numbered according to the force, but when landing the naval brigade, numbers or letters are assigned by the commanding officer of the expedition according to the organization.

Equipment. The officers wear undress and leggings, and carry sword, revolver, haversack, water bottle, pocket book, knife, spoon, cup and blanket rolled, containing flannel shirt, stockings and towel. Weight of sword and revolver, 5 lbs. 5 oz.

The marines wear undress uniform with leggings. Knife with laniard, canteen, haversack, tin cup and spoon, blanket rolled, containing shirt, stockings and towel, rifle, bayonet, accoutrements and sixty rounds of ball cartridge. Weight of rifle, accoutrements and ammunition, 18 lbs.

All blue-jackets wear blue uniform, cap, leggings, knife and laniard, tin cup, spoon, canteen, haversack, and rolled blanket, containing shirt, stockings and towel.

All—officers and men—wear flannel underclothes, and a rigid inspection of shoes and leggings should be made before leaving the ship, and tobacco should be served out to every one.

The men of the infantry companies carry magazine rifle, bayonet, accoutrements and sixty rounds of ball cartridge. Weight of uniform, 9 lbs. 7 oz. —Weight of equipments, 18 lbs. 10 oz.

The men of the howitzer and gatling crews carry their ammunition pouches, a pistol and cartridges. Provision is made in the Ord. Ins. which permits some of the crew to carry rifles under certain circumstances, but the artillery officer should consider whether the advantages gained by having the rifles will outweigh the diminished celerity of the piece in consequence of the added weight to be carried by the men. Weight of pistol and sixty rounds, 6½ lbs.

Signal men carry each a signal kit with gear for signalling by day or night, and are armed with pistols. The signal officer and quartermaster carry glasses.

The pioneers are equipped with tools to whose use they are most accustomed: the most useful tools are, axes, picks and shovels, while saws, crow-bars and sledge-hammers are occasionally needed. The armorer who acts as sergeant of the pioneers, carries a bag containing tape measure, powder flask, gimlet and implements for repairing machine guns and small arms. Weight of axe, 5 lbs. 2 oz.,pick, 3 lbs. 6 oz., shovel, 4 lbs. 5 oz.

The field hospital corps carry a stretcher and the medicine chest, and each man in the hospital party should have a tourniquet and be instructed in its use. It will be found useful to have a small flag, the Geneva Cross, for example, to indicate the position of the hospital.

The paymaster's corps, being charged with the supply of provisions, will have to improvise some way of carrying what is needed beyond what is contained in the haversacks. Cooked rations for two days can be carried in haversacks. If the men are to be on shore for only a few hours, they should have one day's rations; if for one whole day,

they should have two days' rations and so on. The daily allowance of food is made on the following scale—

	Bread	1 lb.	oz.
	Meat	1 "	4 "
	Tea		1 "
or	Coffee		2 "
	Sugar		4 "
	Salt		½ "
		2 lbs.	10 or 12 oz.

making two days' rations weigh about 5 lbs. The reserve of provisions being apportioned by this scale can be easily calculated. The meat is best carried in the shape of canned beef, of which the cases weigh about 60 lbs. The supply of water is very important, particularly in hot climates, and, if water is not found the paymaster should land it in breakers as soon as possible after the landing has been effected. The ship's cook is attached to the paymaster's department and does what cooking is necessary for the command, assisted by the provision men. Kettles will be necessary in the proportion of one to each half company and howitzer crew. A set of scales and weights will be required.

The gunner's gang is charged with maintaining a supply of ammunition. The reserve ammunition can be best carried in limbers, which are supplied for all gatling guns; in default of these, other means of transport may be improvised by joining two field carriages. The ammunition for small arms is in boxes containing one thousand, and they weigh 118 pounds. One thousand rounds of pistol ammunition in a box weigh 72 pounds. Probably not much will be required for pistols, but for the rifles, if the firing is rapid, the expenditure in an action may be as high as eighty rounds a man, though it is not likely. It is desirable to have some means of supplying ammunition readily to any part of the command which may be in immediate need. The gatling limber (3-box) can carry about three thousand, five hundred rounds. For the other ammunition, the weights are—

1 box 3-in. shell	containing	10,	weighs 74 lbs.
1 box 3-in. shrapnel	"	10,	" 85 "
1 box 12-pdr. shell	"	9,	" 111½ "
1 box 12-pdr. shrapnel	"	9,	" 140½ "
1 box 12-pdr. canister	"	9,	" 113½ "

Company drill. To teach anything properly it is necessary to be-

gin with the A B C, and we can have no successful drill unless the men are instructed carefully in the first principles and led on by gradual steps to perfection. The perfection in drill which is attempted, and sometimes reached, is neither necessary nor desirable with sailors : but on the other hand it is necessary that their training should fit them for the work they may have to do. This work, as far as connected with our subject, consists in operating on shore for two or three days at most, never far from their base, in expeditions against savage nations, sometimes, perhaps against civilized ones, always desultory in their nature, occurring rarely, and generally involving some hard fighting. The daily habits of the sailor develope the qualities of self reliance, readiness and fertility of resource, while his mode of life makes danger habitual. These are the very qualities which are needed, and all that remains is to encourage them, and by practical training to adapt them to the end in view. The first difficulty which presents itself is the sailor's dislike of the drill : this arises from the fact that from one end of the cruise to the other his small-arm drill has always been the same, with scarcely any variety ; once a week he is given a musket and drilled at the manual for the greater part of the hour and made to march up and down the gangway in column of fours : sometimes other evolutions are attempted, but they are not those which are useful, and there is so little advance that he soon becomes disgusted and regards it as a necessary evil. This can be obviated by making the drill interesting and instructive, by relieving it of all unnecessary details, and teaching only what is practical and useful. The moment a man realizes that what is being taught him is of some use to him he begins to take an interest, and as long as that interest can be kept up he will learn quickly. The second difficulty is the short time that can be allowed for this especial drill. Sailors need to know so many things that it is not desirable to increase the time, for their other drills are quite as important. The time allowed for instruction in company drill will average one hour a week through the year. This seems very little, but a great deal can be done even in this time if every minute be utilized. To accomplish this the division officer must set before himself a definite standard to be attained, and this must depend upon the kind of work his men may have to do. Their work will not consist in executing dress parades or passing in review, but in operating, in large or small bodies, in a town or country unfamiliar to them, in the midst of a hostile people, in guarding consulates, in repressing insurrections, in bush fighting or perhaps, in storming fortified places. To prepare them for

these duties it is necessary to elaborate a system of instruction which may be changed from time to time as experience suggests, and to make it progressive, so that each time something new is learnt, and, little by little, the man gains in knowledge, and what he learns is learned thoroughly. Before the piece is put into a man's hand he must be taught carefully the principles of the direct step and of the double step, because the habit of marching properly will be of the greatest service when he has to go any distance on shore. The movements of the company which are needed are very few, but they must be so taught that no amount of confusion will throw them out. Wheeling by fours, forming line to either flank and to the front or rear, are all the movements that are necessary, and when these are thoroughly understood the rifle may be put into the man's hand, and he has passed from his A B C to solid work. In the manual of arms every officer wishes his men to be perfect, and more time is wasted in accomplishing this than in any other drill in the navy. Of what practical use is this perfection? The moment the men are landed and commence their work, either of fighting or of manœuvring over rough country, they carry their arms in the most comfortable way and will continue to do so until they have another dress parade on the quarter deck. If you tell a man with a musket to stand still, he will stand at an order: if you tell him to run, he will put it on his shoulder or carry it at a trail, though perhaps not exactly as laid down in the tactics; so that the movements of the manual, over which a great deal of time is spent, are those which the plainest common sense would dictate if they were not taught at all. The true test of efficiency in the manual should be proficiency in rifle practice, in the different kinds of fire, and in bayonet exercise.

To meet such tests the men must first be taught all the parts of the rifle and their uses, and to dismount and assemble it themselves; then the aiming and position drill, carefully in all the details loading and rapid firing with dummy cartridges, aiming at different elevations, with the use of the wind gauge, firing with blank cartridge singly and in volleys, and finally ball practice at known ranges, and judging distance: next a few movements of attack and defence with the bayonet, and the instruction in the manual will be completed. These are not all to be taught in a day, but they can be taught in a wonderfully short time, if it is done systematically and without useless repetitions. The next drill should be instruction in skirmishing. Formerly the skirmishers *prepared the way* for the attack of the main body; now the fighting is done by the skirmish line, and this kind of fighting makes a greater

demand for individual instruction. Each man must be taught to act independently, and yet with the others, and to exercise a certain amount of judgment. The next instruction should be in the duties required of out-posts, advanced guards, and working by small squads under petty officers. More care should be given to the teaching of the petty officers than is generally done, and they should be habituated to exercise command in their companies as readily as in their parts of the ship or in their boats; the sooner they are able to do a certain amount of drilling and instruction themselves, the sooner do they become valuable. But the most important fact to remember is that it is to thoroughness of company drill on the part of the divisional officers that success in shore operations must be due; therefore it is all important that their part of the work should be well done.

Battalion Drill. The movements of the battalion which we need to know are very few, and as a general rule the simplest are the best. Although at first sight it appears difficult to teach any movements of the battalion on board ship, the difficulty will be removed by having a skeleton drill, that is using all the officers and petty officers of the companies, and only four men, to represent a company. In this way those who need the drill can get it even in a confined space. The necessary movements for the march are forming column of fours, and reforming the line, close column of companies or divisions, the deployment of the close column and forming front into line faced to the front or rear. The column of fours is the only practicable order of march, and whenever the column has occasion to halt it should be formed up into close column of companies or divisions. In this formation, in case of sudden attack, it is ready for deployment, and there is no question about the time necessary to bring up the rear, or their condition when they arrive on the ground. Having mastered these evolutions the whole attention may be given to skirmishing. In the skirmish drill of the battalion I do not think it advisable to follow strictly the principles laid down in our tactical book, because the experience in the late wars in Europe shows that other principles have been adopted for all the great armies, and I have used for some time, for skirmishing, a drill which I have made by taking the principles laid down in the English, French and German drill books, and adapting them closely to Upton's Tactics, and this I will now explain with as little detail as possible. The battalion of four companies is deployed for attack as follows. The battalion is formed in two lines with the first, second and third companies in the first line, and the fourth company in the second line as reserve. In

advancing to attack the battalion is divided into (1) fighting line, (2) supporting line, (3) main body, and (4) reserve. The movements of the fighting line are regulated by the battalion commander, and it is important to establish a perfect system of linkmen between himself and the company commanders on the fighting line, and the officers with the main body and reserve, so that his orders may be passed rapidly without necessitating the use of drum or bugle. The duty of the fighting line is to keep up a fire on the enemy whenever it is effective and until the final rush is made. The duty of the supporting line is to reënforce the fighting line, when needed, to make up its losses, to supply ammunition, so that its fire may not slacken. The duty of the main body is to follow up the movements of the fighting line and, with it, to finally force the enemy's position. The reserve is to be used as circumstances may require. The distances between the several parts of the battalion will depend upon circumstances. The fighting line being thrown forward so that it will be about one thousand yards from the enemy, the supporting line about two hundred yards in rear, and the main body about three hundred yards from the supports. Previous to the advance an objective point should be decided upon, and explicit instructions given to the company leaders. At a distance of about fifteen hundred yards from the enemy, the column should be deployed into line with intervals between the companies of half distance. The deployment of skirmishers commences by sending to the front a thin line, numbers one of front rank of each four, as a fighting line; and, as they advance, the skirmishers extend to the right and left. This is followed at the proper distance by the supporting line, numbers two and three of front rank of each four*, followed in turn by the main body. The fighting line must take advantage of any cover it can obtain, but must not diverge from the direct line. The supports and main body keep covered as much as possible. The company commanders accompany that part of their companies which is on the fighting line; the chief petty officers are with the supporting line and the junior company officers are with the main body. This arrangement leaves under the control of the company commander his fighting line and supports, and prevents the confusion which is likely to occur when one company is supported by another. Each company commander can judge if he is so strongly pressed as to need reënforcement, and can reënforce his own line from his own men. Thus the men are always under the con-

* The deployment is always by numbers.

trol of the officer to whose direction they are accustomed, and who knows them all personally. When firing begins it should be slow and careful so as not to waste ammunition. No firing is permitted while advancing, but at a given signal the fighting line will cease firing and advance with a rush for about thirty paces, when they lie down and commence firing again: this gives every man a chance to regulate his sight, and to fire from a rest. The supports and main body follow the movement, gradually diminishing their distances: the thin fighting line is pushed up as close as possible before it is reënforced; and this is done by sending up numbers from the supporting line who are replaced from the main body. On approaching the enemy's position the fighting line is strengthened until it has absorbed the main body, and the reserve is brought up into a supporting position: after this the firing is by alternate companies kneeling, by word of command, and the lines pushed up by companies, advancing with a rush successively, for short distances, under cover of the fire of the rest of the companies. A front attack should be a last resort; before this is attempted every means should be tried to turn one flank or the other. When ready to make the attack word is passed along to prepare to charge, when bayonets are fixed and the line advances at the double: when it has arrived within charging distance the bugles and drums sound the charge. From the moment when the double commences, the first line will appear to be in confusion, which becomes greater as they near the enemy's line. This is in a great measure unavoidable, but every attempt should be made to preserve the alignment to the last moment: and the reserve must be ready to reënforce any portion of the line. In advancing care should be taken to keep the flanks always protected, and this is done by extending the skirmishers on the right and left flanks and bending them back. In receiving an attack the skirmishers must be kept in front as long as possible, and when they are driven in the fire must be given deliberately. It is well to remember that the best way to meet a charge is with a counter charge.

It is quite as important to teach the principles of attack, as the movements which may precede the attack, and all the principles of this method of skirmishing can be taught on board ship. It is advisable to use powder in drilling as soon as the men reach a moderate degree of proficiency, particularly in drilling on shore: for officers and men become accustomed to receiving and transmitting orders in the midst of noise, and are not likely to be gallied by a considerable amount of confusion. The importance of this will be realized on the first drill

with powder, for men who are not in the habit of firing sometimes become extraordinarily excited, and lose their heads even when firing blank cartridges.

Artillery Drill. The same general principles of instruction should be applied to the howitzers as to the company. The only manoeuvres necessary for the howitzer on shore, are wheeling to the right, left, and about, going into battery, and moving by hand to the front or rear, and a very short time is necessary to obtain considerable proficiency in these. What is of vital importance however is to teach the men all about the charges, projectiles and fuzes, the service of the piece, the manipulation of the sight, and judging distance ; so that each man will know the capabilities of his piece and be able to perform any duty at the piece. To make the drill successful it must be systematic, so that in a certain time every thing necessary shall have been taught. As soon as the instruction in working the piece both on shore and in the boat has been completed a series of exercises in target practice should be commenced, with all kinds of ammunition, from the boat and on shore if it be possible. The men should be taught that their weapon is the piece, that their safety in action will depend upon the way they work their piece, and that it only needs judgment and coolness to make it a powerful weapon. One point to which the officer of the piece must especially devote himself is to having as large a supply of ammunition as possible, and every device by which he can increase it will be of the greatest value to him.

Combined Drill. To prepare the men for this drill it is advisable that the old fashioned battalion drill be given up entirely on board ship, and that the drill of the landing party be substituted for it. Whether the ship be large or small it should have a properly organized landing party, and whenever time can be given, it should be drilled as such, care being taken to have all the details perfect in every drill : by doing so men become habituated to their several duties and are all the more ready to perform them when the occasion arrives. If the force consists of only one company and one gun it is better to manoeuvre them together habitually and they will thus get the idea of mutual support. It is of great assistance in any drill to notify beforehand all the officers, who are to take part in it, of every manoeuvre that is to be performed ; in this way every one is prepared and the manoeuvres will be executed properly, and no time will be lost in correcting mistakes. In the same way before entering upon any undertaking of a hostile nature it is advisable to give to each officer any information that may be useful, and

particularly to let each one understand thoroughly what work he will have to do and what is his position in the boats and on shore with reference to the others. A certain amount of practice in manoeuvring the boats is necessary before a landing takes place and it will be found of great assistance to exercise the boats, when armed and equipped for landing, in the evolutions likely to precede a landing, the howitzer boats being placed on the flanks or in the center as circumstances demand. The boats carrying guns when fully equipped, are so much heavier than the others that they are worked with less rapidity and ease, and are likely to throw out all the rest of the boats ; this may be avoided by lashing the heavy boats on each side of the steamers and keeping them there until ready to disembark, and it will then be found that they are always in place, or easily transferred to any point of attack, while, at the same time, their crews are fresh for the work on shore, which is generally very laborious. In forming for landing it is better to form in two or three lines, because the boats in line take up so much more room than their crews do when formed on shore, that too much time would be lost in closing the intervals, and moreover the second line following the first is ready to support. In landing the naval brigade, whether it meets with opposition or not, an advanced force of infantry must be landed first, to scour the country near the beach, and to form a line of outposts to prevent surprise. Next would come the infantry of the first line and the artillery followed by the second line and so on. The artillery should be placed in as favorable a position as possible immediately after being landed, and be ready to open fire. If the landing is opposed, the artillery is used to clear the beach for the infantry, and the artiillery itself should not be landed until the infantry has secured a good footing. When all the forces have been landed, the lines are formed, skirmishers thrown out and the work commences. In the English service an officer is appointed who is styled the Beach Master, a title which we might very well adopt, who is charged with the care of the boats left behind and with keeping up communication with the ships and preparing a depot for ammunition, provisions, water, hospital stores etc. His first duty is to have the boats ready for the reëmbarkation at any moment, and to do this he must be acquainted with the rise and fall of the tide, the currents etc. He should have signal men for communicating with the ships and the forces, and some men to defend his depot. After landing the truth of what I have said about evolutions will soon be evident and officers will realize that the drill book is not tactics, but the true tactician is the one

who is the quickest to see the weak points in his enemy's dispositions, to turn every chance to his own good, to foresee accidents and to provide for them, to save his men as much as possible but at the right moment ready to run any necessary risk, while the governing principle should be to concentrate as many as possible of his own men on the smallest possible number of the enemy.

I do not intend to touch upon field fortification at all; the necessary knowledge is contained in books which are familiar to us and at the command of every one, but the men when on shore should be instructed in intrenching themselves and taught to do it whenever they are under fire. A few minutes will suffice to give a man a small amount of cover in moderate soil, and if men are to remain in any position for any length of time, they should understand how to make a small shelter trench with only their bayonets and tin cups.

I have shown you this evening how, without failing in their duty as sailors, our men have in the past history of the navy done valuable service on shore. We have seen them at Bladensburg and at the head of the Chesapeake, when the militia gave way and they had to stand the brunt of the attacks and secured the safety of Baltimore; we have seen them breaking up nests of pirates in the West Indies, and punishing the Malays in the East Indies; we have followed them in the Mexican war when Stockton in the north with his naval brigade conquered a large territory; when Shubrick in the south captured Mazatlan, and Rowan, Lavallette, Craven and Selfridge kept the west coast in a blaze while Perry occupied and laid under contribution the east coast from the Rio Grande to Vera Cruz: we have been stirred to sympathy for the gallent fellows who fell at Fort Fisher where their defeat contributed to the victory of their brothers in the Army, and since the war we know of the disastrous affair at Formosa, of our men being landed in different parts of the world to protect our own people and the foreign residents, and of the successful expedition to Corea to punish an insult to our flag. In general it will be noticed (1) that in a war like that with Mexico, all the naval operations involve landing parties, and (2) that in time of peace it is principally by means of landing parties that the Navy acts, when it is called upon to act at all. Landings are always liable to take place (1) when we have treaty guarantees to execute as at Panama, (2) in revolutionary countries, where Americans require protection as at Honolulu and Montevideo, (3) in uncivilized countries where attacks may be made on shipwrecked crews, as Formosa and Corea, and (4) at distant points not readily accessible to

troops, as the coast of Mexico or Central America. To ignore the utility of this work is to neglect one great source of usefulness in a squadron which can appear unexpectedly at different points on an enemy's coast and harass him very materially by obliging him to keep strong garrisons at all points.

With such a record in the past it behooves us to maintain it in the present and in the future. We have seen how with limited drill and inferior arms our predecessors of glorious memory acquitted themselves. But modes of warfare have changed entirely in fifty years and even the savage of the present day is no mean enemy, while our men are likely to be pitted against disciplined troops. Shall we then decline to give battle for the honor of our flag or for the protection of our citizens because our enemies may be well armed and drilled, or because we should be off our natural element? Every officer and man in the service would answer—No. The question is not whether the seamen are primarily intended for another kind of service: everybody agrees that the primary purpose of seamen is to man ships and to fight at sea. The question is rather in what way we can bring the most effective force against an enemy whose positions on land we are attacking. If we have a squadron with a thousand men on board, and all the operations have been concluded of which the squadron, as a squadron, is capable, are we to allow our thousand men to remain on board idle while the troops are engaged on shore, simply because their vocation is to fight on the water? It is not proposed to strip the ships and to turn their crews over to the army; but there may be times, as I have shown, when the service required is that combined land and water service for which the seamen are peculiarly fitted. Having the material for this purpose, shall it not be made use of? And if it is to be made use of, it must be prepared by thorough training. With this end in view I have endeavored to present a system of organization and instruction which will render our blue-jackets an efficient force when they are landed.

At the same time I hope I shall not be misunderstood as being in favor of turning the navy into a military machine. Far from it. We must first of all train up a body of men to fight on the sea; but so long as there exists a possibility of our having to fight on shore, let us prepare for that exigency also. By making our drills practical and instructive we shall find that our men learn readily what is needed, and we know that the true sailor possesses a gallantry which only needs to be properly directed to enable him to overcome any obstacles.

The CHAIRMAN: I desire on the part of the meeting to offer thanks to Lieut. Soley for the paper he has just read.

It seems to me that we would make more progress in this matter were we to draw more marked distinctions between Tactics, Grand tactics, and Logistics, and teach them with this distinction in view. The simple tactics, the part to be learned by the *man*, should be taught not as an *end*, as it usually is, but as a *preparation* for drill. It should be boiled down to its simplest form, taught thoroughly once and for all. Then we can proceed to the *real* leading drills, which are important matters for the officer. Here the man merely puts in practice what he has learned; thus giving point to his knowledge and adding interest and, what is more important, experience.

I think if five or six imaginary operations could be worked out in minute detail, selecting for the scene Hampton roads, Newport, and one or two other places where the ships could assemble for landing drills, prepared like a theatrical play, illustrated with large scale colored maps (8 inches to the mile) it would be of enormous benefit. It would be simply necessary to issue an order for operation No. — and make the details for the several roles fill out the cast, so to speak. All the experience of real war would be obtained except in the element of danger. One or two should be for the night.

I believe the true reason of the confusion frequently met with in landing blue jackets is a slovenliness in primary instruction, a slovenliness of which we officers ourselves are not wholly guiltless, as evidenced in the teaching of such movements as *two's right about*, movements utterly unauthorized in the tactics. Company drill is really extremely simple; but it is amazing how few blue jackets know even how to halt. The manual of arms is another matter and is really of small importance. Shooting and manœuvering are the two chief things required.

I do not exactly see the objection to the trumpet. It can readily be learned in a month and is extremely useful in handling squadrons of boats as well as howitzers and skirmishers.

Lieut. Com'r. CHADWICK— I noticed, in a visit which I paid on board the Bellerophon, at Barbadoes, some two years since, kits at hand ready for landing. These were made up of the usual articles of clothing carried by landing parties, and were neatly packed in a canvas cover which could be strapped on as a knapsack. They were made up of course from the men's own clothing. The kits were kept overhead in the men's quarters. Thus nothing but the blanket needed to be added, and they were ready at once. To show that such a thing is necessary, at times, I shall cite the case of the sudden sending off at night of 200 men, from the receiving ship at Norfolk, to Washington, during the riots of 1877, where great confusion ensued from the getting out of clothing etc., many men going without any change whatever. Leggings should be made a part of the uniform, and obligatory.

I am thoroughly in accord with all the ideas expressed by Lieut. Soley, and especially deprecate, with him, the adherence by so many to the idea that the knowledge by the sailor of the use of the musket and of infantry tactics is useless. I regard it as necessary in a very high degree, and think that any seaman is a better man and a better sailor even for this added knowledge. It has been my observation that the men who have shown most proficiency in such things on board ship have at the same time been our best men in seamanship duties. The sphere of a sailor's duties is not so large but that it may contain the knowledge of how to shoot with a small gun as well as with a big one.

Lieut. HANFORD. I would like to ask the lecturer how the paymaster is to transport the provisions etc. and where the men are to get their haversacks and canteens?

Lieut STOCKTON. The lecturer gives canteens and haversacks as part of the equipment of the men of the landing party, and with these water and rations for forty eight hours can be carried by each individual. In point of fact there are no canteens or haversacks among the stores of the ship for

the men, that is for the blue jacket. There is no doubt that by a liberal expenditure of canvas, haversacks can be made, but it is a question whether, with the limited supply of tin ware on board, canteens can be improvised for the whole landing force. It would take a long time to make these articles with the resources of a single ship.

Personally I quite agree with the author of the paper just read in regard to the waste of time in the manual of arms and in the endeavor to get the manipulation of the rifles and the movements generally mechanically perfect; besides being a waste of time, it stifles the individuality of the sailor: and sacrifices celerity and freedom of movements to an unnecessary unity in detail. A writer lately pronounced the uniformity of detail in handling the guns and the mechanically correct manœuvres in marching, wheeling, and alignment as the coxcombry of the profession, and I think it should be relegated to the militia and to avenue parades. In time of actual war this vanishes into thin air and is not of the business of war. I do not wish to say that, given a body of men, to act as infantry, they should be kept in a chaotic state; but the movements taught should be restricted to simply the necessary ones, to those that will conform, as much as possible, to the characteristics that should be found in sailors.

The skirmish drill is well adapted to seamen and should be taught the men more frequently than is now the custom. I hope Lieut. Soley's proposed formation of skirmishers will be thoroughly tested and criticised by military experts.

Master Lyeth. In reply to Lieut. Hanford's inquiry as to the immediate wants of sailors on landing, especially in hot climates, for water, I would state that I took part in several landing parties for exercise conducted by Lieut. Soley, the summer of 1877, in Smyrna; the weather was very warm and a sufficient supply was with some difficulty kept up by the provision men of each company carrying water to their companies in mess kettles.

Lieut. J. W. Miller. The organization of the Naval Brigade which the lecturer has given us to-night I have seen tested practically, both at Annapolis and by two ships of the fleet of which Mr. Soley was flag lieutenant. Although the exercises which have been conducted were necessarily on a peace basis, and the operations on shore bloodless, still all possible contingencies of actual warfare were provided for, and the majority of the details elaborated in the paper just read, were carried out in the most conscientious manner. One point upon which the lecturer dwells deserves the most earnest consideration, and that is the necessity of frequent naval brigade drills on shore. The vessels of our squadrons are so often separated that such drills are rare. Every effort should be made to bring the ships together. Granted that a few vessels may be assembled at some future date, every watch officer in the service should begin to prepare his division for a combined drill, and begin too at the A B C of tactics. Mr. Soley rightly says that a great deal of the so called "infantry" taught on board ship is a waste of time. When I first had a division my ambition was to make the men proficient in the manual, and at least three months were thrown away in drilling "by the numbers". Moreover, like most young graduates, I had the tendency to give too much time to explanation, and too little to execution. The short routine exercises should not be used up with talk. A man-of-wars-man learns much more readily by a simple repetition of an order than from long descriptions to which he is not listening; while the lazy landsmen are nothing loath to let the officer use his voice, while they stand at an "order" or comfortable "right-shoulder." Explanatory exercises should never, and never can, be combined with quick, spirited drills.

The next and most important point of all is to teach the men to load and fire properly. This is rarely acccomplished in a satisfactory manner on board ship. The quarterly allowance of small arm ammunition is usually expended at a target swung from the fore-yard arm; the men thus get in the habit of firing high and the range is too short. There is no reason why

Wingate's aiming drill, with the assistance of sand bags, should not be employed at first, to be followed by the armory target practice used with so much success by the militia. The Lowell cartridge company is now manufacturing a strong reloading shell, to contain eight grains of powder and a bullet, which will carry two hundred yards. A large folding target of boiler plate could be used in connection with this cartridge: the men to fire from aft; the target to be placed on the forecastle; the folds to form side screens, and a protection for the deck.

The proficiency of the divisions and companies is of the last importance and it behooves the watch officer to attend to all the minutiae, without which the larger operations on shore will prove failures.

I entirely agree with the lecturer that blank cartridges are not enough used on shore drills. All of us know the great difference that exists at great-gun drill between the actual general quarters with and without powder. Every detail may be seemingly perfect in the latter; yet when the men have to handle real charges for the first time, noise and confusion are often the result. Such confusion is tenfold greater when we pass from the ordinary battalion parades to the action of the skirmish line—even with blank cartridges. In case of a battle, the brigade which has been accustomed to the use of powder will undoubtedly stand fire better, while the linkmen and aides will have had much experience in passing the word from the outer line, and carrying orders quickly and quietly. Those gentlemen who have been to the "farm drills" at the Naval Academy, will appreciate the force of the foregoing remarks.

In conclusion, I would like to ask the lecturer whether, in his opinion, the skids formerly provided for landing howitzers, and still in use by some ships, are as serviceable as the single shifting spars coming into service, My experience with the latter leads me to think them far superior to the cumbersome skids advocated by so many officers.

Lieut. Soley: It is a matter of gratification to me to find that the ideas which I have put forward have been so well received. I am sure that all thinking men must see, sooner or later, that every thing must be eliminated from our drills that is not necessary as a preparation for war, and at the same time that nothing must be omitted which would tend to that end. My experience has taught me that the only way to have a successful drill is to take plenty of time in preparing the details; the more thoroughly the details are prepared the more will all concerned be ready for actual service, and in our squadrons we want to get as ready as possible in the shortest possible time. A great deal might be done on board the receiving ships, where our newly enlisted men are trained, by having an organized landing party; individual officers may work here and there, and work hard, but they have to encounter, on one hand, prejudice, which is disheartening, and, on the other, apathy, which is ten fold more aggravating. In such cases arguments avail nothing. If arguments did any good they might be taken beyond our own naval history, and shown how almost every navy in the world in the last ten years has used its naval brigade more than any other part of its naval force. In the Franco-Prussian war a whole division was landed from the French fleet and sent, under a Vice Admiral, to garrison the forts around Paris. In the Ashantee and Zulu campaigns the English landed their men and they were valuable coöperators with the army. When the English fleet went into the sea of Marmora, they immediately made preparations to land men to hold the lines of Bulair. Does any one think that this could have been done without complete preparation?

After the preparation of drill should come the preparation of equipment. Mr. Hanford has asked where we would get the canteens and haversacks with which the men are to be supplied. Of course, we have none furnished to our ships, and if we had to improvise them from the ship's stores a man would be at his wit's end: haversacks might be made, while the canteens

would give more trouble. I think that if any one of us were going on an expedition he would not hesitate to buy them if he could, but I think that enough of each should be supplied for the landing party of each ship. With regard to the transport of provisions some means must be improvised which will depend upon circumstances: in some cases the native population may be impressed into the service; in civilized countries means of carriage will be easily found; but it is proposed that each man shall carry enough for two days: more is not likely to be required.

With regard to the use of the trumpet I do not think it is very useful except for very simple signals, such as forward, halt, charge, commence or cease firing, and the like. For extended movements aids and wig wag signals are the best.

I think that the skids which are furnished for the launches are worse than useless, for they are only lumber in the boat, and weight which does no good. We are not likely to have in a boat any gun which is too heavy to be handled by a shifting spar. The tactical movements which a sailor needs to know are few in number: the officer needs to know the principles of tactics, and he has plenty of opportunities to learn them if he chooses: and most officers will have sufficient pride in their profession to learn them if they will only reflect that they are more likely to be called upon to fight on shore than on the sea.

PROFESSIONAL NOTES.

These Articles have not been read before the Institute, but are inserted by direction of the Executive Committee.

Details concerning the capture of the Huascar. Questions asked by the officers of the U. S. S. Pensacola, and answered by a Lieutenant of the Chilian Navy who served on board the Almirante Cochrane in her fight with the Huascar off Angamos October 8, 1879.

Question 1. What is your opinion of the way the Huascar was fought? first as to the handling of the ship, and second as to the serving and pointing of the guns?

Answer. I consider that the Huascar, during action, was very poorly handled; from beginning to end she did nothing but try to escape, notwithstanding that those on board of her saw that our ship was steaming nearly a knot more than she. Captain La Torre steered straight for her, in order not only to shorten the distance but to bring her to the condition you mention in the second question. In my opinion, and in that of our captain, she ought to have preferred steering west, and finally given us her ram, but never her stern. The same shot which killed Captain Grau disabled part of the rudder chains leading to the fighting wheel; from that moment recourse was had to relieving tackles aft, and it is worth noticing that no officer appears to have been attending to these. No executive officer was killed or wounded outside of the fighting turret; no communication was established through voice tubes, telegraphs, et cetera, to after part of the ship: steering was carried on by word of command only—the worst possible thing in action, the words *babor* (port) and *estribor* (starboard) being so similar that a mistake is very easy.

The serving of the Huascar's guns, judging by the amount of firing, was not bad—especially during the first half hour. As regards pointing, I can only say it was wretched—in fact could not have been worse.

QUESTION 2. Do you not think that, when you got on the Huascar's quarter, you had her not only in a very disadvantageous position to herself but in a position from which she could not easily extricate herself ?

ANSWER. I quite agree with you—after we got close to her.

QUESTION 3. Was your speed uniform throughout the action? Was the Huascar's? What were they?

ANSWER. Our speed was uniform during action ; so was the Huascars : eleven to eleven and a half, and ten and a half to eleven knots respectively. No hitch of any sort occurred in machinery or boilers on board of either ship. According to our chief engineer's statement our ship's speed might have been increased towards the end of the action, when she attained her highest pressure. The ship's bottom and boilers had lately been cleaned and overhauled. The Huascar had been four months out of dock—her bottom being rather foul.

QUESTION 4. What projectiles did you use? What fuzes? Captain Breese says that when he was on board the Cochrane last April, both you and your brother spoke very highly of some new fuze you had just received ; what were these and did you use them?

ANSWER. We used Palliser shell, provided with gas-checks ; no cored Palliser shot were fired, although a sufficient number are kept loaded in battery. Two of the gas-checks were found in the captain's cabin after piercing the plating of the stern. Quill friction tubes of not very good quality were only employed. If I remember well, Captain Breese must refer to an ebonite electric tube we received last year, and which I am sorry was not employed for want of a sufficient number of firing keys. I consider that there is nothing safer than an ebonite tube and firing key.

QUESTION 5. What do you believe was the effect of the shots, which penetrated the Huascar's turret, upon the men inside? Were many of her wounded hurt by splinters from the backing?

ANSWER. We do not think that many were wounded by splinters from backing, but by some occasioned by shell after piercing the ship's side.

QUESTION 6. Was there any particular reason why you did not attempt an electric broadside, or was that method of firing distrusted before the action began?

ANSWER. An electric broadside was not distrusted, but considered unnecessary. On preparing for ramming, our guns are fired independently and in succession ; the two bow guns are laid for three hundred yards right ahead, and the others on the beam close along side : these

last cannot converge inside of two hundred yards. On passing alongside the Huascar, two guns on the side were only ready in time; the bow gun was fired as explained in my letter to Lieut. Meigs, and the other one missed fire from a bad tube.

Question 7. Did the Captain find any difficulty in handling the ship with the fighting wheel? Was the communication and reply easy?

Answer. The fighting wheel was not used in our ship during action. As firing whilst under full speed has been often tried, I do not think that any difficulty would be experienced in handling ship with this wheel. The shifting from one wheel to the other is done in less than two minutes.

Question 8. When the Huascar was taken possession of, was she boarded by a large party? What was her condition, as found by this party? What steps ought an officer commanding such a party to take to prevent the destruction of his prize? Was her crew demoralized, or were they still under control?

Answer. The Huascar was boarded, taken possession of, fires extinguished, two sentries posted, engine-room valves and water-tight compartments, (between engine and boiler room), closed by six men (riggers), two line officers and one engineer. Not a man was allowed to leave our battery or lower deck. On getting alongside the monitor, our boat was almost swamped by a crowd of sailors and soldiers carrying large bundles of clothes. I was helped over the side by the paymaster, midshipmen and other people, being received, cap in hand, by Lieutenant Gareson. The crew was in a dreadful state of excitement and fear, imploring our men not to kill them. The lining in the captain's turret had caught fire, and fallen through into the magazine flat; on this account, the Peruvian officers and men thought that the ship would blow up. The officers had no control whatever over the crew; the dead were lying about the decks—the captain's state-room being a heap of mangled corpses; the ship undoubtedly was very much knocked about. A sentry was immediately posted at engine-room and magazine door, and some of the prisoners made to help in extinguishing the fire. The engineer and firemen closed the water-tight door and valves, and put donkey in motion; the engineer reported engine, boiler and magazine safe ten minutes after we boarded her,—Rifles, in perfect working condition and about a hundred in number, were found untouched in their respective racks below. There were three feet of water on engine-room floor: bunkers full of midshipmen: wing-passages obstructed by the civil branch. The flag was lowered twice, and the Huascar's engines

were stopped after being hailed by Captain La Torre to do so. We ran alongside, and lowered our only boat not inboard at the time.

As regards steps to be taken by an officer boarding a prize, I really can suggest nothing (except closing water-tight doors), for it is my strong belief that a ship can easily be made to sink despite every effort of those who board her as a prize.

QUESTIONS ASKED BY LIEUTENANT J. F. MEIGS, U. S. N.

QUESTION 1. What is the light thrown on the relative value of broadside and bow fire by the fight off Angamos?

ANSWER. We are unable to say much or even appreciate the relative value of bow and broadside firing, as we always fought the Huascar on the chase; we only fired with our two starboard foremost guns, the angle of training of which you are well acquainted with. A form of battery like the Cochrane's presents great advantages in a case like ours.

QUESTION 2. How many shots did the Cochrane fire with her bow gun, with the centre gun, with the after gun?

ANSWER.	With	the	starboard	bow	gun,	20 rounds.
	"	"	port	"	"	none.
	"	"	starboard centre,		"	16 rounds.
	"	"	port	"	"	1 round.
	"	"	starboard after,		"	none.
	"	"	port	"	"	1 round.

QUESTION 3. Did the Captain determine to run close to the Huascar at first, in defiance of any risk he might run in approaching?

ANSWER. The Captain determined not to open fire until at two thousand metres range, this being the range at which our guns can penetrate an armor similar to the Huascar's; besides he desired to destroy the enemy's ship at all hazards. The Huascar opened fire at three thousand and four hundred metres.

QUESTION 4. Was all firing by guns, singly?

ANSWER. The firing was carried on independently, rectifying the distance after every round.

QUESTION 5. Why was it the Huascar was not damaged by plunging fire, when you were so near her, and why did you not ram?

ANSWER. We were close to the Huascar on two occasions when ramming was tried at nearly right angles; we missed, and passed about five yards astern of her; our bow gun, trained right ahead, was fired at two hundred yards, and the centre one, trained abeam, with three

degrees depression, missed fire the first time and was being reloaded on the second. Plunging fire and ramming therefore never took place. One of the above bow shots hit the monitor's turret, and she immediately changed her course.

QUESTION 6. Was the smoke from guns and smoke stacks a serious impediment at any time, to handling the ship? If it was, please state the positions of ships, and the circumstances of wind and weather when it was so.

ANSWER. Neither the smoke from the funnel nor the smoke caused by the firing of our guns prevented the good management of the ship. We used smokeless coal, and steaming ahead continually at almost full speed prevented any great accumulation of smoke. At the most the battery was dark for about twenty seconds, our two fighting guns having been fired almost simultaneously. The weather was fine and clear with no wind; ship rolling quietly to an extreme (with her head east) of five degrees.

QUESTION 7. When in close action how long did it take to serve the 9-inch guns? Please state the distance.

ANSWER. Our men have had a good amount of training and loaded their guns in no time, i. e., thirty to forty seconds. Firing became sometimes difficult on account of the ever changing position of the enemy. Our first shot struck at one thousand seven hundred yards. Most of the firing was done at eight hundred to five hundred yards. You can take two minutes as an extreme limit of the time taken to fire each gun.

QUESTION 8. How long had you been in action when you first thought the Huascar actually beaten?

ANSWER. The Huascar was considered lost or actually beaten before an hour's fighting, when her stern was about twenty degrees open towards starboard bow, and at five hundred metres distance. In this position, we had our strongest power and facility of management against the weaker part of the enemy. The nwe damaged her stearing-gear for the second time, and the arrival of the Blanco precipitated her surrender.

QUESTION 9. What was the effect on your armor of the Huascar's 10-inch shot?

ANSWER. The Huascar's 10-inch Palliser shell was fired at about six hundred yards and struck our 6-inch armor on an angle of incidence of thirty degrees It penetrated three inches, removed bolts, inner lining, and broke on a beam. It probably broke up.

Question 10. What light has been thrown on the question of the value of small-arms and machine-guns?

Answer. Our machine guns and top riflemen were of great value to us. The Huascar's deck guns were deserted by their crews. It can be said that in a ship with guns mounted on an open deck it will become almost impossible to serve them under an enemy's fire at five hundred yards from mitrailleuses and top riflemen.

Question 11. About how long had your guns' crews been in training, and about how many practice shots had each gun-captain fired.

Answer. Our guns' crews have been in almost constant training for nearly fourteen months. It is difficult to state the number of practice shots that each gun-captain had fired. In peace time our ships are supposed to get firing practice twice a year; notwithstanding our men have had many opportunities of practising whilst cruising along the enemy's coast.

Huascar. Showing Probable Direction of Shots.

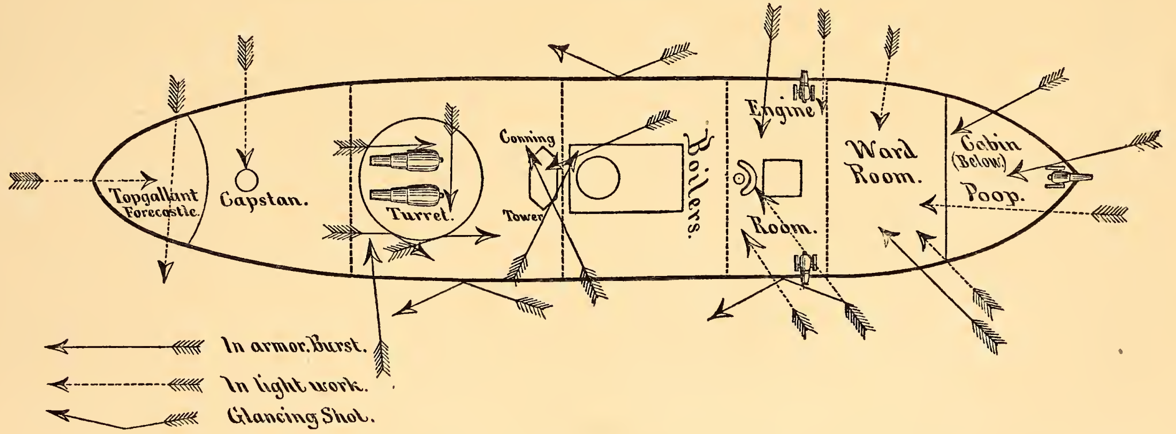

Photo-Electrotype Co. Boston.

THREE LETTERS CONCERNING A DISPUTED FACT.

The description of the battle of Mobile bay, given in the Life and Letters of Admiral D. G. Farragut, should have put an end to the long controversy respecting the "lashing to the mast." The discussion has, however, been again revived in several of the public journals, and articles have appeared to prove, on the one hand, that the admiral was not lashed at all to the Hartford's rigging, and, on the other, that he was securely bound to the futtock shrouds on going into the action. The following letters furnished the Institute by Loyall Farragut Esq., will, it it is trusted, forever settle the hitherto moot question, originally raised on the exhibition of a painting by Page, representing the position of the admiral during the passage of the forts. The first communication is from an old man-of-war's-man who served all through the war with Admiral Farragut, and reads as follows:—

U. S. Str. Phlox, Naval Academy, Annapolis, Md.
March 2, 1880.

Mr. Loyall Farragut,

Sir:—I see that you have written a life of your father, and that some of the newspapers say that the admiral was not lashed to the Hartford's rigging during the Mobile fight.* * * * Now, as I was chief quartermaster of the Hartford, and the man that lashed the admiral to the rigging, I ought to know something about it.

When we got close to the forts, I heard Mr. Kimberly, the executive officer, tell Mr. Watson, our flag lieutenant, to have a rope passed around the admiral. I was at the time busy with some signal flags for the monitors. Mr. Watson ordered me to go up in the port main rigging, where the admiral was, and put a rope around him. I cut off a fathom or two from a new lead line, which was lying on the deck; went up the ratlines to where the admiral was standing with opera glasses in his hands—just under the futtock shrouds, and made the forward end of the line fast. As I took the other end around the admiral he passed the remark that the rope was not necessary; but I went on and made the after end secure. I don't think he noticed the rope around him, as we were square abreast of fort Morgan; and it was pretty hot work. But when the ship got clear of the forts the

THE CHRONODEIK.

THE FOLLOWING DESCRIPTION OF THIS INSTRUMENT IS TAKEN FROM "THE SCIENCE OBSERVER," VOL. III., NO. 3.

"The instrument designated by the above title, is one which was devised to furnish a convenient means for finding the time within a second. It will be found to possess very great advantages in cheapness and simplicity over any instrument now in use, and is perfectly adapted to the wants of astronomical amateurs, watchmakers, surveyors, and exploring parties.

This instrument, the principle of which is entirely new, consists of a swinging bar, suspended, at its upper end, on a pivot, in such a way as to permit the bar to assume freely a vertical position without any torsional revolution. To the bar is affixed a small telescope, the object-glass near the bottom, the eye-lens at the top of the bar. Below the object-glass a frame is fixed to the bar, carrying a plane mirror swinging on a horizontal axis and provided with a clamp for fixing the mirror at any desired inclination. Below this is a metal bob. The whole instrument thus forms a pendulum, which is suspended inside a large tube, at the base of which are approximate leveling screws. A smaller tube at the top carries a dark-glass directly over the eye-lens of the enclosed telescope, without touching it. The cut shows the general external appearance of the instrument. The mirror, with the milled heads by which it is revolved and clamped, is seen through the apertures near the bottom of the enclosing tube.

From the above description of the construction it is evident that, if the instrument is turned so that the mirror is toward the sun, and the mirror is revolved on its horizontal axis until the rays from the sun are reflected directly up the telescope tube, an eye looking into the instrument from the top will see an image of the sun in the field of view. As the sun rises or falls in the heavens this image will rise or fall in the field of view, and its passage may be observed over a horizontal bar or wire placed in the common focus of the eye and object-glasses and so adjusted in direction that it represents a section of a small

circle in the heavens paralled to the horizon. This brief explanation will indicate the mode of using the instrument in getting the time by equal altitudes of the sun. For this purpose it possesses the most surprising facility. In cheapness and simplicity it has, of course, very greatly the advantage over the sextant—the use of which, with the artificial horizon, requires considerable skill, and involves much trouble and inconvenience—as well as over the small, portable Watchmaker's Transit, which requires careful mounting and adjustment, and even more skill and trouble than the sextant, in practical use. The instruments which have so far been constructed are very compact, and are portable in the coat pocket. They have object-glasses of six inches focus, the magnifying power being seven or eight diameters. The whole instrument is about one and three fourths inches in diameter, and stands about nine inches high. With instruments of this size and construction, the probable error of a single determination of the clock error

Wherever "circle of equal altitudes" occurs in this article, please read "horizon".

P. F. H.

For Observations on Morning and Afternoon of the Same Day.

Set the instrument at any convenient time in the morning, not very near noon, so that the long aperture in front of the plane mirror faces the sun. Level by the foot-screws, so that the pendulum swings freely. Loosen the clamp-screws, (right hand milled head), and, looking into the telescope, turn the mirror by the left hand milled head until the sun appears in the field of view. Adjust and clamp the mirror so that the sun, when the pendulum hangs free and still, will be a little below the bar or wire in the field. Turn the instrument laterally, so that the sun is a little to the right of the centre of the field, and will in rising diagonally, by the diurnal motion, touch the wire near the centre. Observe the time, by watch, when the first limb or edge of the sun touches the wire, and also when this edge is completely across the wire. In general, this interval will be from twelve seconds to eighteen seconds. Record the mean of these times. About three

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From the above description of the construction it is evident that, if the instrument is turned so that the mirror is toward the sun, and the mirror is revolved on its horizontal axis until the rays from the sun are reflected directly up the telescope tube, an eye looking into the instrument from the top will see an image of the sun in the field of view. As the sun rises or falls in the heavens this image will rise or fall in the field of view, and its passage may be observed over a horizontal bar or wire placed in the common focus of the eye and object-glasses and so adjusted in direction that it represents a section of a small

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DIRECTIONS FOR MAKING AND REDUCING OBSERVATIONS WITH THE CHRONODEIK.

For Observations on Morning and Afternoon of the Same Day.

Set the instrument at any convenient time in the morning, not very near noon, so that the long aperture in front of the plane mirror faces the sun. Level by the foot-screws, so that the pendulum swings freely. Loosen the clamp-screws, (right hand milled head), and, looking into the telescope, turn the mirror by the left hand milled head until the sun appears in the field of view. Adjust and clamp the mirror so that the sun, when the pendulum hangs free and still, will be a little below the bar or wire in the field. Turn the instrument laterally, so that the sun is a little to the right of the centre of the field, and will in rising diagonally, by the diurnal motion, touch the wire near the centre. Observe the time, by watch, when the first limb or edge of the sun touches the wire, and also when this edge is completely across the wire. In general, this interval will be from twelve seconds to eighteen seconds. Record the mean of these times. About three

minutes after the 2d limb of the sun will pass the wire. Observe and record this in the same way as the first limb. Set the instrument carefully aside until a corresponding time after noon. Then set the instrument in the sun, level, and, *without disturbing the mirror clamp*, observe and record the passage of both limbs of the sun, as in the morning observation.

Reduction.—Take the mean of the times of the passage of the sun's first and second limb at the morning observation; also, the mean of the two times at the afternoon observation; then take the mean of these two means. The Chronometer time of local apparent noon is then found by the Equation of Equal Altitudes.

For Observations on Afternoon of one Day and on Morning of next Day.

In this case the only differences to be noted in the above directions are the following:—At the first or afternoon observation the mirror is to be adjusted and clamped, so that the sun will be a little *above* the wire.

It may not be out of place to add the following precautions:—Never observe *through a* window pane; even the best plate glass will distort the sun's image and vitiate the result. Arrange to observe the contacts of the sun with the wire as near the middle of the field as possible. Never disturb the mirror clamp between the two observations, as upon the fixity of this adjustment depends the precision of the result. If the sun is partially obscured by cloud, the observation can be often made by removing the cap containing the dark glass. The most rapid motion in altitude occurs, of course, when the sun is near the prime vertical, or directly east or west. It is scarcely necessary to say that in carrying the instrument about, between observations, it should be held in a slightly inclined position, so that the pendulum, resting against the side of the tube, cannot swing about and jar the mirror adjustment."

The *Chronodeik* appears to be a very ingenious illustration, or application, of well known laws of Optics and Gravitation. The thread placed in the common focus of the eye and object glasses should be parallel to the direction of the *circle of equal altitude* at its intersection with the vertical circle passing through the body observed. Practically, I presume, this is effected by fixing the thread parallel to the horizontal axis of the mirror; and this adjustment should be sufficient, provided the centre of the thread can be closely estimated. I think the instrument would be improved by using a second thread, perpendicular to and bisecting the first.

The Chronodeik is restricted essentially to the approximate determination of time. The sextant may be used for the same purpose, and it seems unnecessary to argue that it is the best instrument in general use for the closely approximate determination of angular measurements.

The description of the Chronodeik says that "the actual results of an extended series of experiments with several instruments shows the probable error of a determination with one instrument to be about eight tenths of a second. This degree of accuracy is probably sufficient for the purposes of most of those who will be likely to use the instrument, although it could easily be enhanced."

When the sextant is used the same formula for reduction is employed. Professor Chauvenet remarks, "The chief source of error is in the observation itself. The most practised observers with the sextant cannot depend on the noted time of a *single* contact within $0^s\ 5$, and hence the intervals between the successive chronometer times (which, if observations could be perfectly taken, would be sensibly equal) may differ 2^s. But the greatest probable error of the chronometer time of sun's or star's transit, from the mean of six such observations on each side of the meridian, is found to be not more than $0\ 2^s$, provided the rate of the chronometer between the observations is uniform." (*Chauvenet's Lunar Distances and Equal Altitudes*, *page 72*.)

Using either instrument, errors due to changes in refraction may be almost wholly removed by computation. With the Chronodeik the observations are restricted to the transit over a single thread of the two limbs of the sun, while with the sextant the noted times of contact may be numerous. Stars may be employed with the latter instrument, but not with the former in its present construction.

The Chronodeik may be improved by enlarging it, and substituting a reticle for the single thread, with means of illuminating the reticle, but in its present form it is apparently inferior to the sextant. It is doubtful that the uses of the instrument would justify the improvements and increased expense.

P. F. HARRINGTON.

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REAR-ADM. G. B. BALCH, U. S. N., in the Chair.

THE FLEETS OF THE WORLD—THE SAIL PERIOD.

By the late COMMO. FOXHALL A. PARKER, U. S. N.

After the defeat of the Spanish Armada, with which, as the close of the galley period, our first volume necessarily ended, England fitted out many expeditions against the possessions and commerce of Spain, which, if not always successful, served, nevertheless, to foster a spirit of maritime enterprise among her people, and to impress foreign nations with exalted ideas of the daring and resolute character of British seamen, who, even when overpowered, ten to one, disdained to strike their colors, while they had a shot in the locker, or an ounce of powder in the magazine. A notable instance of this obstinate courage occurred in 1591, when Vice-Admiral Greenville, in the Revenge—a vessel famous from having borne the flag of Drake—withstood, for sixteen hours, the attack of "a whole Spanish fleet of fifty three sail and ten thousand men." Finding it impossible to resist longer, the heroic admiral prepared to set fire to the magazine; but, being prevented from so doing by his crew, he was forced to surrender, after having received three wounds, two of which were mortal. He expired calmly, a few days after the action, his last words being, "Here die I, Richard Greenville, with a joyful and quiet mind; for that I have ended my life as a true soldier ought to do, fighting for his country, queen, religion, and honor; my soul willingly departing from my body."

Depending more and more on sails for propulsion, the man-of-war of the sixteenth century had undergone a gradual transformation, in model, armament, mastage, and rigging, until it had become such as is made known to us by Charnock, in his description of the Great Harry. In Protestant England a change had taken place, too, in the names of vessels, and in the habits and customs of seamen; the saintly appellations, in vogue in Queen Mary's time, having given place to such names as The Dreadnaught, The Defiance, The Water-Sprite, and The Mermaid, while the coaster, no longer lowering his sails nor dipping his flag to the shrine of Our Lady of Bradestow, seemed disposed to rely rather upon himself than upon Our Lady, or even his Patron Saint, for protection, when buffeted by the waves and winds of the tempestuous British channel.

In 1603, when James the First ascended the throne, and peace was concluded with Spain, British merchants, who, until then, had been in the habit of transporting their wares to and from foreign countries in English bottoms, began to hire vessels from all nations for this service, and, notwithstanding that the Corporation of the Trinity, in 1615, in a petition to the king, showed that such had been the decline of British shipping, in consequence of this impolitic custom, that there were not then more than ten ships belonging to the port of London of over two hundred tons burthen, it was unable, through the opposition of the mercantile community, to get an act passed prohibiting it. On a certain day, however, two London merchants, "more observant than their brethren," while walking along the banks of the Thames, chanced to see two Dutch ships, "laden with coffee and cotton (the property of Hollanders resident in Great Britain"), dropping their anchors off the city. The vessels were of large size, and, being well manned and armed, presented a formidable appearance; and the idea seemed to seize the two Englishmen, at the same moment, that, while the Flemish traders, by their wise conduct, were creating a powerful merchant marine, which, besides serving as a nursery for their seamen, must prove a most valuable acquisition to the Navy of Holland, in time of war, they, by their unwise course, were actually exposing their coast, in the event of a rupture with one of the great maritime powers, to blockade, and perhaps even to invasion.

"The idea spread like wild fire:" and such was the change of opinion, among the whole body of the merchants, that "the nation, with one accord, sedulously applied itself to the creation of a civil Navy;" so that, in 1622, there were belonging to Newcastle alone one

hundred large vessels. The East India Company, too, which had received its first patent from Queen Elizabeth, in 1600, had now become an exceedingly powerful and influential corporation, and, with its capital of five hundred thousand pounds sterling, maintained a fleet of fine ships, all of which were well armed and many of great size, one in particular having a capacity of eleven hundred tons.

Inclined to peace as he was by nature, James had the good sense to see that he could only secure it by being prepared for war, and that a Navy was all important to the safety of England; and, as he was possessed of an inquiring mind which led him to pursue with avidity scientific investigation, he perceived, further, that the plans for the construction of vessels of war submitted to him by Phineas Pett, "gentleman, and some time Master of Arts at Emanuel College, Cambridge," were far in advance of those of the shipwrights of his kingdom. He therefore intrusted to him the building of "the greatest and goodliest vessel," according to Stone, "that had yet been builded in England." She was called the Prince Royal, and Charnock speaks of her as "the parent of the identical class of shipping which continued in use up to his day" (1802). "Were the absurd profusion of ornament", he goes on to remark, "removed, the contour or general appearance of the ships would not so materially differ from the modern vessels of the same size, as to render it an uncommon sight, or a ship that a mariner would hesitate to put to sea in."

Besides the Royal Prince, Pett built a number of smaller vessels, by order of the king, who, during his reign, "augmented the Royal Navy one fourth part." Charles the First also added to it several fine ships, of which "the most goodly by far" was The Sovereign of the Seas, thus described by Thomas Heywood, in his tract entitled—A true Description of his Majesty's royal ship, built this year, 1637, at Woolwich, in Kent, to the Great Glory of the English nation, and not to be paralleled in the whole Christian world:

"Upon the beak head sitteth royall King Edgar on horseback, trampling upon seven Kings; now what he was, and who they were, I shall briefly relate unto you, rendering withall a full satisfactory reason to any impartiall reader why they are there, and in that manner placed.

Upon the stemine head there is a Cupid, or a child resembling him, bestriding and bridling a lyon, which importeth that sufferance may curbe insolence, and innocence restraine violence, which alludeth to the great mercy of the King, whose type is a proper embleme of that

great majesty, whose mercy is above all his workes. On the bulk-head right forward stand six severall statues in sundry postures, their figures representing Consilium, that is Counsell; Cura, that is Care; Conamen, that is Industry; and unanimous endeavors in one compartement; Counsell holding in her hand a closed or folded scrole; Care a sea compasse, Conamen, or Industry, a luit stock fired. Upon the other, to correspond with the former; Vis, which implyeth Force, or Strength, handing a sword; Virtus, or virtue, a sphearicalle globe; and Victoria, or Victory, a wreath of lawrell. The moral is, that in all high enterprizes there ought to be first, Counsell to undertake, then Care to manage, and Industry to performe: and, in the next place, where there is ability and strength to oppose, and vertue to direct, Victory consequently is alwayes at hand ready to crowne the undertaking. Upon the hances of the waste are foure figures, with their several properties; Jupiter riding upon his eagle, with his trisulk, from which hee darteth thunder, in his hand; Mars, with his sword and target, a fox being his embleme; Neptune, with his sea horse, dolphin, and trident; and, lastly, Æolus upon a camelion, a beast that liveth onely by the ayre, with the foure windes his ministers or agents; the East called Eurus, Subsolanus, and Apliotes; the North winde, Septemtrio, Aquilo, or Boreas; the West, Zephyrus, Favorinus, Lybs and Africus; the South, Auster, or Notus. I come now to the sterne, where you may perceive upon the upright of the upper counter standeth Victory, in the middle of a frontispiece, with this general motto, *Validis incumbite remis.* It is so plaine, that I shall not need to give it any English interpretation. Her wings are equally display'd; on one arme she weareth a crowne, on the other a laurell, which imply Riches and Honour; in her two hands she holdeth two mottoes, her right hand which pointeth to Jason, beares this inscription, *Nava*; which word howsoever by some, and those not the least opinionated of themselves, mistaken, was absolutely extermin'd and excommunicated from a grammatical construction, nay, jurisdiction, for they would not allow it to be verbe or adverbe, substantive nor adjective; and for this, I have not only behind my back bin challenged, but even *viva voce* taxed as one that had writ at randum, and that which I understood not. But to give the world a plenary satisfaction, and that it was rather their criticisme than my ignorance, I entreate the reader but to examine Rider's last edition of his dictionary, corrected and greatly augmented by Mr. Francis Holyoke, and he shall there read, *navo, navas*; and therefore consequently *nava* in the imperative mood signifies a

command to imploy all one's power to act, to ayde, to helpe, to endeavor with all diligence and industry, and therefore not unproperly may Victory point to Jason, being figured with his oare in his hand, as being the prime Argonaut, and say, *nava*, or more plainely, *operam nava*; for in those emblematical mottoes there is alwayes a part understood. Shee pointeth to Hercules on the sinister side, with his club in his hand, with this motto, *Clava*, as if she would say, O Hercules, be thou as valiant with club upon the land as Jason is industrious with his oare upon the water. Hercules againe pointing to Æolus, the god of windes, saith, *Flato*, who answereth him againe, *Flo*. Jason pointing to Neptune, the god of the seas, riding upon a sea-horse, saith, *Faveto*, to whom Neptune answereth *No*. These words *Flo* and *No* were also much excepted at, as if there had been no such Latine words, till some examining their grammar rules, found out *Flo*, *Flas*, *Flari*, proper to Æolus, and *No*, *Nas*, *Nari*, to Neptune, etc.

In the lower counter of the sterne, on either side of the helme, is this inscription:—

Qui mare, qui fluctus, ventos navesque gubernat,
Sospitet hanc arcam Carole magne tuam.

Thus Englisht:

He who seas, windes, and navies doth protect,
Great Charles, thy great ship in her course direct.

There are other things in this vessel worthye remarke, at least, if not admiration; namely, that one tree or oake made foure of the principall beams of this great ship, which was forty foure foote of strong and serviceable timber in length, three foote diameter at the top, and ten foote diameter at the stubbe or bottome. Another as worthy of especiall observation is, that one peece of timber, which made the kelson, was so great and weighty, that twenty-eight oxen and foure horses with much difficulty drew it from the place where it grew, and from whence it was cut, downe unto the water side.

There is one thing above all these for the world to take especiall notice of, that shee is besides tunnage just so many tuns in burden as their have beene yeares since our blessed Saviour's incarnation, namely, 1637, and not one under or over. A most happy omen, which though it was not the first projected or intended, is now by true computation found so to happen. It would bee too tedious to insist upon every ornament belonging to this incomparable vessel, yet thus much

concerning her outward appearance. She hath two gallaries of a side, and all parts of the ship are carved also with trophies of artillery, and types of armour, as well belonging to land as sea, with symboles, emblemes, and impresses, appertaining to the art of navigation; as also, their two sacred Majesties' badges, of honour, armes, eschutcheons, etc, with severall angels holding their letters in compartements; all which workes are gilded quite over, and no other colour but gold and blacke to be seene about her; and thus much, in a succinct way, I have delivered unto you concerning her inward and outward decorements. I come now to describe her in her exact dimensions.

Her length by the keele is one hundred and twenty eight foote, or there-about, within some few inches. Her mayne breadth or widenesse from side to side forty eight foote. Her utmost length from the fore end of the sterne, *a prora ad puppim*, two hundred and thirty two foote. She is in height, from the bottome of her keele to the top of her lanthorne seventy-six foote. She beareth fire lanthornes, the biggest of which will hold ten persons to stand upright, and without shouldring or pressing one the other.

She hath three flush deckes and a fore-castle, an halfe deck, a quarter decke, and a round house. Her lower tyre hath thirty ports, which are to be furnished with demi-cannon and whole cannon throughout, being able to beare them. Her middle tyre hath also thirty ports for demi-culverin, and whole culverin. Her third tyre hath twentie sixe ports for other ordnance. Her forecastle hath twelve ports, and her halfe decke hath fourteene ports. She hath thirteene or fourteene ports more within board for murdering peeces, besides a great many loope holes out of the cabins for musket shot. She carrieth moreover ten peeces of chase ordnance in her right forward, and ten right aff, that is, according to land service, in the front and reare. She carrieth eleven anchors, one of them weighing foure thousand foure hundred, etc, and according to these are her cables, mastes, sayles, cordage, which, considered together, seeing Majesty is at this infinite charge, both for the honour of this nation and the security of his Kingdome, it should bee a great spur and encouragement to all his faithful and loving subjects to bee liberall and willing contributaries towards the ship money.

I come now to give you a particular denomination of the prime workemen imployed in this inimitable fabricke; as first, captayne Phineas Pett, overseer of the worke, and one of the principal officers of his Majestie's navy, whose ancestors, as father, grandfather, and great great grandfather, for the space of two hundred yeares and up-

wardes, have continued in the same name officers and architectures in the royall navy, of whose knowledge, experience, and judgement, I cannot render a merited character.

The maister builder is young Mr. Peter Pett, the most ingenious sonne of so much improved a father, who, before he was full five and twenty years of age, made the model, and since hath perfected the worke which hath won not only the approbation but admiration of all men, of whom I may truly say as Horace did of Argus, that famous ship-master, who built the great Argo, in which the Grecian princesse rowed through the Hellespont, to fetch the golden fleece from Colchos:

> Ad charum tritonia devolat Argum
> Maliri hanc puppim imbet.

That is, Pallas herselfe flew into his bosome, and not only injoyn'd him to the undertaking, but inspired him in the managing of so exquisite and absolute an architecture.

Let me not here forget a prime officer, master Francis Skelton, clerke of the checke, whose industry and care in looking to the workmen imploy'd in this structure, hath beene a great furtherance to expedite the businesse.

The master carvers are John and Mathias Christmas, the sonnes of that excellent workeman, master Girard Christmas, some two yeares since deceased, who, as they succeed him in his place, so they have striv'd to exceed him in his art, the worke better commending them than my pen is any way able, and I make no question, but all true artists can, by the view of the worke, give a present nomination of the workemen.

The master painters, master joyner, master calker, master smith, &c., all of them in their severall faculties being knowne to bee the prime workemen of the kingdom, more selectedly imploy'd in this service."

Of the manner of collecting and transporting the timber necessary for the building of this "prodigious great ship," we are informed by Mr. Pett himself in his diary.

"I, This day," (May 14th, 1635), he writes, "took leave of his Majesty at Greenwich, with his command to hasten into the north to provide and prepare the frame timber, plank and treenels, for the new ship to be built at Woolwich. I left my sons to see the moulds and other necessaries, shipped in a Newcastle ship, hired on purpose to transport our provisions and workmen to Newcastle. Attending the bishop of Durham, with my commissions and instructions, whom I

found wonderfully ready to assist us, with other Knights, gentlemen, and justices of the county, who took care to order present carriage, so that in a short time there was enough of the frame ready to lade a large collier, which was landed at Woolwich, and as fast as provisions could be got ready, they were shipped off from Chapley wood, at Newcastle, and that at Barnspeth park from Sutherland. The 21st of Dec. we laid the ship's keel in the dock, most part of her frame coming safe was landed at Woolwich. The 16th of January, his Majesty, with divers lords, came to Woolwich to see part of the frame and floor laid, and that time he gave orders to myself and my son to build two small pinnaces out of the great ship's waste. The 28th, his Majesty came again to Woolwich, with the Palgrave, his brother, Duke Robert, and divers other lords, to see the pinnaces launched, which were named the Greyhound and Roebuck."

To complete the account of the British Navy, up to the time of the first Dutch war, and to show how, in the opinion of an Englishman, its vessels and its men then compared with those of other navies, the following extract, from Fuller's Worthies of England, is as pertinent as it is amusing:

The Navy Royal.

It may be justly accounted a wonder of Art. And know, the ships are properly here handled, because the most, best, and biggest of them have their birth (built at Woolwich) and winter abode (nigh Chatham in the river of Medway) in this county. Indeed, before the reign of Queen Elizabeth, the ships royal were so few, they deserved not the name of a fleet; when our kings hired vessels from Hamborough, Lubeck, yea Genoa itself. But such who, instead of their own servants, use chairfolk in their houses, shall find their work worse done, and yet pay dearer for it.

Queen Elizabeth, sensible of this mischief, erected a Navy royal (continued and increased by her successors) of the best ships Europe ever beheld. Indeed, much is in the matter, the excellency of our English oak; more in the making, the cunning of our shipwrights; most in the manning, the courage of our seamen; and yet all to God's blessing, who so often hath crowned them with success.

If that man who hath *versatile ingenium* be thereby much advantaged for the working of his own fortune, our ships, so active to turn and wind at pleasure, must needs be more useful than the Spanish galleons, whose unweildiness fixeth them almost in one posture, and maketh them the steadier marks for their enemies.

As for Flemish bottoms, though they are finer built, yet as the slender barbe is not so fit to charge with, they are found not so useful in fight. The Great Sovereign, built at Woolwich, a lieger-ship for state, is the greatest ship our island ever saw. But great medals are made for some grand solemnity, whilst lesser coin are more current and passable in payment.

I am credibly informed, that that mystery of shipwrights, for some descents, hath been preserved successively in families, of whom the pets about Chatham are of singular regard. "Good success have they with their skill"; and carefully keep so precious a pearl, lest otherwise amongst many friends some foes attain unto it! It is no monopoly which concealeth that from common enemies, the concealing whereof is for the common good. May this mystery of ship-making in England never be lost, till this floating world be arrived at its own haven, the end and dissolution thereof!

I know what will be objected by foreigners, to take off the lustre navy royal, viz.; that, though the models of our great ships primitively were our own, yet we fetched the first mould and pattern of our frigates from the Dunkirks, when in the days of the Duke of Buckingham (then admiral) we took some frigates from them, two of which still survive in his majestie's navy, by the names of Providence and Expedition.

All this is confessed; and honest men may lawfully learn something from thieves for their own better defence. But, it is added, we have improved our patterns, and the transcript doth at this day exceed the original. Witness some of the swiftest Dunkirks and Ostenders, whose wings in a fair flight have failed them, overtaken by our frigates, and they still remain the monuments thereof in our navy.

Not to disgrace our neighboring nations, but vindicate ourselves, in these nine following particulars the navy royal exceeds all kingdoms and states in Europe;

1. Swift Sailing; which will appear by a comparative induction of all other nations.

First, for the Portugal, his *Caroils* and *Caracts*, whereof few now remain (the charges of maintaining them far exceeding the profit they bring in); they were the veriest drones on the sea, the rather because formerly their ceiling was dammed up with a certain kind of mortar to dead the shot, a fashion now by them disused.

The French (how dextrous soever in land battles) are left-handed in sea fights, whose best ships are of Dutch building.

The Dutch build their ships so floaty and buoyant, they have little hold in the water, in comparison of ours, which keep the better wind, and so outsail them.

The Spanish pride hath infected their ships with loftiness, which makes them but the fairer marks to our shot. Besides, the wind hath so much power of them in bad weather, so that it drives them two leagues for one of ours to the leeward, which is very dangerous upon a lee shore.

Indeed, the Turkish frigates, especially some thirty-six of Algiers, formed and built much near the English mode, and manned by renegadoes, many of them English, being already too nimble-heeled for the Dutch, may hereafter prove mischievous to us, if not seasonably prevented.

2. Strength.

I confine this only to the timber whereof they are made, our English oak being the best in the world. True it is (to our shame and sorrow be it written and read) the Dutch of late have built them some ships of English oak, which (through the negligence or coveteousness of some great ones) was bought here and transported hence. But the best is, that, as Bishop Latimer once said to one who had preached his sermon, that he had gotten his fiddlestick but not his rosin, so the Hollanders with our timber did not buy also our art of ship-building.

Now the ships of other countries are generally made of fir and other such slight wood; whereby it cometh to pass, that, as in the battle in the forest of Ephraim (wherein Absalom was slain), "the wood devoured more people that day than the sword;"* the splinters of so brittle timber kill more than the shot in a sea-fight.

3. Comeliness.

Our frigates are built so neat and snug, made long and low; so that (as the make of some women's bodies handsomely concealeth their pregnancy or great belly) their contrivance hideth their bigness without suspicion, the enemy not expecting thirty, when (to his cost) he hath found sixty pieces of ordnance in them. Our masts stand generally very upright; whereas those of the Spaniards hang over their poop as if they were ready to drop by the board; their decks are un-

* 2 Samuel xviii. 8.

equal, having many risings and fallings, whereas ours are even ; their ports, some higher in a tier than others, ours drawn upon an equal line.

Their cables are bad (besides subject to rot in these countries), because bought at the second hand; whereas we make our best markets, fetching our cordage from the fountain thereof.

4. Force.

Besides the strength inherent in the structure (whereof before), this is accessary, consisting in the weight and number of their guns: those of the

Sixth		10, 12, 14, 16, 18, 20,	
Fifth	Rates	22, 26, 28, 30,	Ordnance
Fourth	carrying	38, 40, 44, 48, 50,	mounted.
Third		50, 54, 56, 60,	
Second		60, 64, 70,	

The Royal Sovereign, being one of the first rates, when she is fitted for the seas, carrieth one hundred and four pieces of ordnance mounted.

5. Seamen.

Courageous and Skilful,—for the first, we remember the proverb of Solomon: "Let another praise thee, not thy own mouth, a stranger, not thy own lips."* The Spaniards with sad shrug, and Dutch with a sorrowful shaking of their heads, give a tacit assent hereunto.

Skilful.—Indeed navigation is much improved, especially since Saint Paul's time; insomuch that, when a man goes bunglingly about any work in a ship, I have heard our Englishmen say, "Such a man is one of St. Paul's mariners." For though, no doubt, they were as ingenious as any in that age to decline a tempest,† yet modern experience affords fairer fences against foul weather.

6. Advantageous Weapons.

Besides guns of all sorts and sizes, from the pistol to whole cannon, they have round-double-head-bur-spike-crow-bar-case-chain-shot. I join them together, because (though different instruments of death) they all concur in doing execution. If they be wind-ward of a ship, they have arrows made to shoot out of a bow, with fire works at the end, which if striking into the enemy's sails, will stick there, and fire

* Proverbs, xxvii. 2.

† Acts, xxvi.

them and the ship. If they lie board and board, they throw hand-grenades with stink-pots into the ship; which make so noisome a smell that the enemy is forced to thrust their heads out of the ports for air.

7. Provisions.

1. Wholesome; our English beef and pork, keeping sweet and sound longer than any flesh of other countries, even twenty-six months, to the East and West Indies.

2. More plentiful than any prince or State in all Europe alloweth; the seamen having two beef, two pork, and three fish days. Besides, every seaman is always well stored with hooks to catch fish, with which our seas do abound; insomuch that many times six will diet on four men's allowance, and so save the rest therewith to buy fresh meat, when landing where it may be procured. I speak not this that hereafter their allowance from the king should be less, but that their loyalty to him, and thankfulness to God, may be the more.

8. Accommodation.

Every one of his majesty's ships and frigate officers have a distinct cabin for themselves; for which the Dutch, French and Portuguese do envy them, who for the most part lie *sub dio* under decks.

9. Government.

Few offences comparatively to other fleets are therein committed, and fewer escape punishment. The offender, if the fault be small, is tried by a Court-martial, consisting of the officers of the ship; if great, by a council of war, wherein only commanders and the judge-advocate. If any sleep in their watches, it is pain of death. After eight o'clock none, save the captain, lieutenant, and master, may presume to burn a candle. No smoking of tobacco (save for the privilege aforesaid) at any time, but in one particular place of the ship, and that over a tub of water. Preaching they have lately had twice a week; praying twice a day; but my intelligencer could never hear that the Lord's Supper for some years was administered aboard of any ship, an omission which I hope hereafter will be amended.

But never did this navy appear more triumphant, than when in May last it brought over our gracious sovereign, being almost becalmed (such the fear of the winds to offend with over roughness); the prognostic of his majesty's peaceable reign.

The Farewell.

Being to take our leave of these our wooden walls; first, I wish that they may conquer with their mast and sails, without their guns; that their very appearance may fright their foes into submission.

But if, in point of honour or safety, they be necessitated to engage, may they always keep the wind of the enemy, that their shot may fly with the greater force, and that the smoke of their powder, pursuing the foe, may drive him to fire at hazard! May their gunner be in all places of the ship, to see where he can make a shot with the best advantage; their carpenter and his crew be always in the hold, presently to drive in a wooden plug (whereas a shot comes betwixt wind and water), and to clap a board with tar and camel's hair upon it till the dispute be over; their chirurgeon and his assistants be in the same place (out of danger of shot) to dress the wounded; their captain be in the uppermost, the lieutenant in every part of the ship, to encourage the seamen; the chaplain at his devotions, to importune heaven for success, and encouraging all by his good council, if time will permit!

The reader having now been made acquainted with the English navy, it becomes necessary, in order that he may have a proper understanding of the battles which it fought with the navy of the united Provinces, to trace the rise and progress of the latter, up to the moment of actual conflict, and to touch briefly upon the history of that remarkable people, whose self-reliant, fearless, independent, and energetic character enabled their country to carry on, to a successful issue, an eighty years' war with Spain, and to compete, for so long a period, with its great maritime rival, for supremacy at sea.

Holland or Ollant, as the earliest Dutch writers styled the land they inhabited, is said to mean marshy ground, "which," remarks Bosworth, "exactly suits the fenny and boggy soil it designates. Look for the word in the Teuthonista of Van der Schueren, and you will find '*Beven daveren als eyn ollant, scatere*'—tremble under the feet as a marshy ground." Pliny mentions it as "a county over which the ocean pours in its flood twice every day, and produces a perpetual uncertainty, among its inhabitants, whether they are living upon the land or at sea," while English seamen were wont to speak of it, contemptuously, as "a bit of mud carried over from the Channel on the leads of British pilots."

Its first inhabitants, so far as we know, were the Batavians, whom Tacitus characterizes as the bravest and most warlike of the Germans, and it is from this tribe that Grotius, Erasmus, and others of the most

learned Dutch authors claim the Dutch of the 17th century to be descended; but as the historian Wagenaar asserts positively that the Batavians had become so exhausted in Rome's wars that in the 5th century their very name became obliterated from history, how, it may be pertinently asked, could there be any of their blood remaining among the inhabitants of their country, twelve hundred years later? Batavia, overrun by horde after horde of fierce barbarians, fell finally into the hands of the Friezlanders, a people resembling its primitive inhabitants in every respect. Among their virtues not the least was the tenacity with which they clung to ancient friendships, perferring old friends to new even for companionship in the world to come. Wilfran, Archbishop of Sens under Charles Mastel, after much persuasion, believed he had prevailed upon king Radbod of Friezland to be baptized. The king, indeed, had gone so far as to place one foot upon the font when he asked—"Are my ancestors among the blessed in heaven?" "Assuredly not," replied the good bishop, "they are damned"—"I will not, then," exclaimed Radbod starting back, "forsake my many friends in hell, to dwell with a few Christians in Heaven." *

In the 10th century, a part of ancient Batavia, under the distinctive name of Holland, organized a separate government for itself, of which Diedrick was made the head, with the title of Count of Holland, (A. D. 903); Philip the 2nd of Spain being the last who was raised to this dignity in 1581. Philip, being a bigoted Catholic and infringing the rights of Holland and the neighboring States, Holland united with four of them in 1579, and with two others in 1581, to resist Spanish tyranny. This confederation formed the seven united Provinces of Holland. Friezland, Utrecht, Gueldres, Zutphen, Overyssell and Groningen, whose inhabitants, accustomed to struggle with the very ocean itself for the soil they inhabited, were not disposed to submit tamely to encroachments from other quarters. With admirable independence, considering the age in which they lived, they declared, in their manifesto, that "the prince is made for the people, not the people for the prince," and that "the prince who treats his subjects as slaves is a tyrant whom his subjects have a right to dethrone."

The Federal Government was composed of a States General to which all the States sent their representatives, a Stadtholder who was Captain General and Admiral and had the appointment of all military and naval commissions, a Treasurer, a Conservator of the Peace, and

* Dans. History of Holland.

a Grand Pensionary; but, as the three last named officers were entirely independent of the first, while all held their offices at the will of the States General, which could neither make war nor peace if a single province objected thereto, it is clear that the people of the united Provinces were themselves the source and end of all power.

In 1650, the office of Stadtholder was discontinued; but revived in 1654, by decree of the States General, and conferred on the Prince of Orange as an hereditary rank.

As might have been expected from their position, the Netherlanders applied themselves, at a very early period, to marine pursuits, and especially to fishing, which in the end became a source of such immense national wealth to their country that the discovery of an improved method of drying and barrelling herrings, in 1414, gained for its author, Jacob Benkelson, the everlasting gratitude of his countrymen; the great Charles the 5th, on one of his many journeys, stopping to visit the monument erected to his memory, because he regarded him "as one of the greatest benefactors of mankind."

By degrees, their voyages were extended, from the fishing banks on their own and the English coast, to the countries bordering on the Atlantic Ocean and the Baltic and Mediterranean seas, and finally, to the remotest corners of the habitable globe; their ships increasing in size as the ports which they were required to visit became more distant. Their vessels differed from those of other nations in their having more beam in proportion to their length and in their flatter floors, the sands which environ their coast obliging them to make them of as light draught as possible; and "this principle acting forcibly on the minds of an economical people, that the greater the breadth which is given to a vessel the less will be the expense in constructing it, proportioned to the commodities that it will be able to contain."

So advanced were the ideas of the Dutch, as regards commercial enterprise, that they held it as good policy for a nation to supply even its enemies with munitions of war, since if not so supplied, they would obtain them from another source, "while an enemy's gold" they argued, "passed as readily as a friend's."

In 1638, a merchant of Amsterdam, named Beyland, upon being dragged before the magistrates of that city on a charge of having violated the neutrality of his country by carrying powder and muskets to Antwerp, then besieged by the Spaniards, boldly admitted the accusation, declaring that the people of Amsterdam had a right to trade where they pleased, and that "for his part he would risk burning his

sails on a voyage to hell, if anything could be made by bringing brimstone therefrom."

The magistrates with one accord approved of his course and ordered that he should be discharged from custody. Such, in brief, were the condition and temper of the merchants and the merchant marine.

In 1589, the navy of The United Provinces, which previously to this period had been, like that of England before the time of Henry the Seventh, a mere assemblage of armed merchantmen, was placed upon a regular footing. A Board of Admiralty was created, consisting of seven members, of which the Admiral-in-chief was the head, who remained in office for three years. Their duties were to build and fit ships, to supply them with cannon and other munitions of war, and to see that their crews were provided with good clothing and provisions and regularly paid. Their navy, under this system, gradually increased until it consisted of about one hundred large vessels, for coast defense, and some sixty or seventy yachts and pinnaces of eighty or less tons each, to protect their rivers and inland seas.

In 1602, the Dutch East India Company was formed, which, with its large capital and fine ships, well manned and armed, added greatly to the naval resources of the country.

But the great strength of the Navy consisted in this, that it was founded upon the affections of the people, and kept alive by their traditions, there being scarcely a family in the whole United Provinces without one or more representatives in it; so that its services and its heroism became the themes of every fireside, the old men telling of the storms they or their comrades had weathered and the battles they had taken part in, and the young men listening with attentive ears to the recital, anxious to emulate the deeds of their sires.

Thus on some evenings the story would be told of Piet Hein's doings at San Salvador, and of his capture of the Silver Fleet—on others of the patriotism of rear-admiral Klaaszoon, who, being surrounded by a Spanish fleet, defended his vessel until his masts were gone, his ammunition exhausted, and every man of his crew either killed or desperately wounded, when he proposed to the survivors to blow up the vessel that none might fall alive into the enemy's hands; and we may imagine the effect upon young and old as the narrators would go on to describe the scene that followed *. The rear-admiral, kneeling down in the midst of his officers and men, and with hands clasped and eyes

* Cerisier, Tome, iv. p. 541.

uplifted to Heaven asking pardon for his and their sins, and invoking a blessing upon his country; and then coolly setting fire to the train leading to the magazine, and yielding up his life here for immortality hereafter.

But the story which was oftenest told and most eagerly looked for was that of the destruction of a Spanish fleet at Gibraltar by the gallant Heemskerk; for it was a tale of valor unsurpassed in naval annals, and of peculiar interest to the Dutch people as the first great triumph of their navy over that arrogant foe, under whose ruthless tyranny their land had, for almost a hundred years, groaned. The facts are these:

In the latter part of the 16th century, the loss to Dutch shipping by the depredations of Spanish cruisers was so great as seriously to alarm the merchants of the United Provinces, lest it should be actually swept from the ocean. In this emergency, the States General resolved to fit out a fleet expressly to cruise against Spanish commerce, and "to assail the Spaniards at sea and on land."

For this purpose, in 1607, a force of twenty-six of their largest and best vessels was collected, armed with cannon of the heaviest calibre, and provided with every thing necessary for its efficiency that gold could procure. Its officers and crews were picked men and, by unanimous consent, the command-in-chief was conferred upon Jacob Van Heemskerk, a man of exalted courage and singular modesty, who had made two voyages to the Arctic Ocean, and commanded the fleet of the East India Company, in a successful engagement with the Spaniards, in 1604.

On the 25th of March, the armament set sail, and on the 24th of April, while running along the Spanish coast, the admiral was informed by a Frenchman that he had seen twenty-one Spanish men-of-war in the straits of Gibraltar standing in for the town. This was just the opportunity Heemskerk wanted; so he assembled his captains on board his flag-ship, the Æolus, and explained to them his plan of battle, and, after they had returned to their commands, made all sail with a leading wind for the straits, which he reached early on the following morning.

As he approached Gibraltar, the Spanish fleet was observed to be anchored in a semi-circle off the quay, which was of stone, and bristling with cannon, while the wings of the fleet were protected by castles strongly garrisoned, whose guns frowned defiance toward the sea.

The admiral had been standing on deck for several long hours, anxiously waiting to catch a glimpse of the foe. He was dressed in full uniform and wore a helmet on his head. "There they are", said he, pointing out the Spaniards to his flag-captain, the gallant Verheoff—"nine galleons and twelve smaller vessels. Their crews already outnumber ours two to one, and yet soldiers are being carried off to them by boat-loads; but we will give them a sound drubbing, nevertheless." His commanders now came on board to receive his last orders, and, having drunk a glass of wine together, vowed to stand by each other and their admiral to the death. "Comrades," said the admiral in reply, "you have now an opportunity of winning the gratitude of your country and the admiration of mankind. Do your whole duty then and follow me; I shall be foremost in the fight." He then shook hands with them all round, and they left the ships.*

The Æolus now took the lead, with the wind a little forward of the port beam, followed by the other vessels in close order, all with every rag of canvas set, and steered for the Spanish Admiral's ship, which was a little apart from and to seaward of the leemost vessel of the enemy's line.

As the Dutch came toward him in this dashing style, the Spanish admiral, Don Juan Alvarez d'Avila, who was standing on the quarter deck of his magnificent flag-ship, the St. Augustine, carrying seven hundred officers and men, sent for the master of a Rotterdam vessel who was a prisoner on board, and asked him what he presumed to be Heemskerk's intention. "He intends to attack you, I think," replied the skipper curtly.

Alvarez was a brave man who had done his duty gallantly at Lepanto, and, as he glanced at the bronzed faces of his seamen and felt the strength of his position, he laughed a scornful laugh—"Why a single squadron of my fleet, covered as we are by the shore batteries, would be more than a match for your countrymen", said he, "even if they were led by the Cid. Surely their admiral cannot be mad enough to engage us."

"We shall soon know," admiral, was the quiet response; "but see they are at prayers, as is the custom in our Navy before joining battle."

The ships were so near now that Alvarez could see what was passing on their decks, where he noted with astonishment that all hands were kneeling. In a few minutes, however, the Dutchmen rose to their feet,

* Cerisier, Tome iv, p. 544.

and after taking a "farewell draught" from an immense bowl which one of their number passed around, went to their quarters and commenced shotting their guns. Then D' Avila comprehended that they were really in earnest, and, not wishing to be surrounded, he cut his cable and made sail toward the town, coming to anchor again just inside of his vice-admiral.

"Shall we engage the vice-admiral, sir?" asked the captain of the Eolus of his superior.

"No" replied Heemskerk sternly, "nor waste a shot on him as you pass; reserve your whole fire until we get alongside of the admiral and our anchor is gone. Two hundred gilders for the man who brings down his flag." So onward he went, leaving the vice-admiral on his left and bearing up a little to get on the St. Augustine's starboard side, while Captain Lambert Hendrickson of Rotterdam, in the Black Bear, ranged upon her port quarter, the other vessels keeping their course, and *doubling* on the enemy, as they reached his column, so that every Spanish ship engaged found herself at close quarters with two antagonists.

But, as the Eolus was rounding the stern of the San Augustine and taking in her canvass, the Spaniard opened upon her with his stern chasers, keeping up a brisk fire with his starboard guns as they were brought to bear, and, at the same time, manning his port battery, in readiness to discharge a broadside at the Black Bear.

Yet Verheoff, in strict obedience to his orders, made no reply until he had got his berth and his anchor was let go, when, in a loud voice, heard from one end of the ship to the other, he cried, "Now, boys, let them have it—Fire."

The vessel was still quivering from the recoil of her guns, when a ball from the San Augustine came crashing through her after bulwarks, throwing splinters in all directions, one of which, striking Heemskerk's left leg, so crushed it, that the broken bones protruded from the skin in several places, and he fell, bathed in blood, to the deck. Verheoff ran to him, and, stooping over him, endeavored to raise him in his arms. But the dying man, amid all his agony, was true to himself and his country—"Let me remain where I am", he whispered; "give all your thoughts to your ship—victory is certain—keep my flag flying until the battle is won." Then, seizing his faithful friend's hand, he pressed it to his heart, and expired.

The Dutch ships by this time had all reached their position, and the battle was raging everywhere from the centre of the Spanish fleet to its

extreme rear, while the vessels of the Spanish van, having cut their cables, were hastening to their friends' relief, some being already before the wind, and others still wearing under their jibs. As they sailed down inshore of the combatants, they poured broadside after broadside into the Starboard Dutch column, whose twelve vessels suffered fearfully from the cannonade: but when, upon gaining their berths, they anchored, and, swinging round, some with their bows and some with their sterns toward the foe, exposed themselves to a raking fire, the Dutch opened upon them with such effect that two of their number, with their masts over their sides and their cables absolutely cut in twain, drifted ashore, while one of them, a huge galleon, blew up, and several were set on fire.

The Dutch meanwhile had not escaped unscathed; but were riddled with shot from stem to stern, and many of them took fire from the burning Spanish ships with which they or their consorts had been engaged, finding it impossible to avoid them as they drifted alongside.

The Groningen, after whipping two Spanish ships, had laid herself alongside of a third, when her foremast went by the board, and her captain fell dead upon the deck.

Finding themselves thus deprived of their commander, the crew gave up all as lost and flinched from their guns. At this critical instant, the cabin door flew open and a flaxen haired boy of about ten years of age rushed upon deck, and, throwing his arms around the neck of the corpse, covered its pale face with kisses. Then, springing to his feet, he ran to the crew and with flashing eyes, although his cheeks were still wet with tears, called upon them to avenge his father's death.

The cheer that arose in response to this appeal was heard above the din of battle throughout the fleet, and the next instant the Groningen's men, headed by their remaining officers, were on the deck of the Spaniard, and driving their enemies before them, some below and some over the high bulwarks into the sea.

So the fight continued until near sunset, ceasing only with the utter destruction of the Spaniards, while not one single Dutch ship was destroyed or fell into the enemy's hands.

The gallant D'Avila was killed, and of his officers and men so many were slain that "their bodies floated about the bay in countless numbers until the following day."

As the Dutch ships, after their work of death, stood slowly out of Gibraltar bay, their men manned the rigging and filled the air with their cheers, for as yet, outside of Verheoff's vessel, none knew that

their great admiral was killed; but when his flag and the ensign of the Eolus, lowered to half-mast, gave notice of the fact, a feeling of gloom overspread the whole fleet; for each man felt that he had lost a friend, while all regarded his death as a national calamity. His body was carried to Amsterdam and buried in the Oude Kerk, where the marble monument erected to his memory is still pointed out by his countrymen. An inscription on it, by the poet Hooft, records his virtues and his heroism.

With such teachings, it is not surprising that every adventurous boy in the Provinces took to the sea as naturally as a sea-gull, nor that the Dutch navy soon acquired an enviable reputation throughout the world. Although the Spaniards had done their utmost to cripple it, it seemed to grow stronger under their blows, until in 1639, Philip the Fourth, of Spain, undeterred by the fate of the Invincible Armada, sent against it the whole sea force of his kingdom, in a last grand effort to destroy it, and to regain (so rumor had it)* the sovereignty of the lands lost through his grandfather's bigotry.

This armament, which consisted of sixty-seven large vessels,† carrying, in the aggregate, two thousand guns and twenty-five thousand men was commanded by Don Antonio de Oquendo, an officer of great repute in the Spanish service, and a relative of the famous Miguel de Oquendo, "the Philip Sydney of Spain," who, upon being asked by the Duke of Medina Sidonia for his advice, when the Invincible Armada seemed to be drifting upon the dangerous shoals off the coast of Holland, replied with spirit: "Seek counsel of Diego Florez, your excellency. All I ask is to be kept well supplied with powder and ball".‡

Leaving Corunna in the latter part of August and steering for the British channel, this formidable armament reached Cape Grisney on the 15th of September, where it found, awaiting its arrival, a Dutch Squadron of observation, dispatched by the Prince of Orange, on information from the Court of France, of Philip's designs—a force weak

* Rumor was as false on this occasion as it usually is, since the commander-in-chief of the armada, as we shall presently see, had orders to avoid the Dutch fleet altogether.

† This is the Dutch account, corroborated by the English. The Spanish historians say sixty vessels and twenty thousand men. The discrepancy probably arises from the fact that a squadron of Dunkirk vessels joined the Spaniards after they sailed from Spain.

‡ Digalo Diego Florez—Mandè me vuestra excelencia a municionas de balas.

in the number of its vessels (only thirteen all told), but strong in the character of its seamen, and especially so in its commander-in-chief, the fair-haired-boy, now grown to middle age, whose heroic conduct on board the Groningen had saved that vessel, as we have seen, from falling into the enemy's hands. This was the famous Marten Harperts Tromp.

When Tromp sighted the Spaniards, he sent orders to Admirals De Witte and Bankert, who were cruising between Dunkirk and Dover, to join him with their commands without delay, and then bore away, with flowing sheets, up the channel, firing guns every half hour, to apprise all Dutch craft that might chance to be within hearing, of the approach of the foe.

Early on the morning of the 16th, DeWitte, who had heard the signal guns, hove in view, with five large ships, and, in obedience to instructions, he was soon on board the admiral's ship, the Brederode, where the captains of the fleet, summoned by signal, were also fast assembling.

When all were met, Tromp invited each one to give his views as to what was best to be done, beginning with the junior captain; and, as usual in Councils of war, the opinions were conflicting, until it came to the turn of De Witte to speak, who so vehemently urged an immediate attack that he carried with him the whole Council—all but the Admiral, who shook his head disapprovingly as he looked toward the Spaniards, and, pointing out to his officers the disparity in size and in armament of the fleets, reminded them that, if they should be defeated, there would be nothing between Oquendo and their Fatherland but Bankert's small force of twelve vessels!

DeWitte however—a man of dull perceptions, but of great animal courage, who could see no duty before him, when the enemy was in sight, but to engage—still adhered to his opinion that it would be best to attack at once; and at last Tromp consented, when all took a glass of wine together, and the Council broke up.

All this time the two fleets were running along the coast of France, with the wind off the land, on their starboard beam, the Dutch being some five miles in advance; but, upon a signal from their flag-ship, the latter wore in succession and stood for the enemy, Tromp beginning the action by pouring a broadside into the Spanish admiral, while DeWitte, sailing recklessly into the midst of the Armada, became engaged with four of its largest galleons.

For some hours the battle was very hot, and, when it ended (at about 4 P. M.), De Witte's ship had been fearfully cut up in masts,

rigging, and hull, and one of the largest of the Dutch vessels, the Saint Christopher, blown up; but the Spaniards had suffered even more, and they bore up for the English coast, with the Dutch hanging on their heels.

On the night of the 18th, Tromp succeeded in concentrating his whole force on the rear Spanish division, subjecting it to a terrific cannonade, and, at the dawn of day, on the 19th, Bankert was descried approaching with twelve fresh ships, whereupon Oquendo made all sail for neutral waters, coming to anchor in the Downs, under cover of Deal castles.

The Spanish admiral could scarcely have committed a greater blunder, since the anchorage he had chosen did not afford room for the deployment of half his large force, while, of its two entrances, the Southern entrance was but two miles wide and the Northern one so extremely narrow as not to admit of the passage through it, of more than one vessel at a time.

So soon as he found himself in this trap, Oquendo should have availed himself of the first fair wind to force the Southern channel, but he did nothing of the kind; and Tromp, quick to take advantage of an enemy's errors, lost no time in communicating to The States General the condition of affairs, and urging upon its members, collectively and individually, not only in written communications, but orally, through the lips of his intimate personal friends, the wisdom of sending to him without delay every available ship and man in The Seven United Provinces, that "he might at one blow make a complete finish of the Spaniards." And nobly did the States respond to his earnest solicitations; for, day by day, and hour by hour, during the space of almost a month, fresh ships reported to him; the British channel, the while, from the Goodwin Sands to the coast of Holland, being alive with transports bringing men, provisions, and arms. On a stormy night, towards the end of September, twelve Dunkirk ships, carrying four thousand men, and piloted by British fishermen, got away "through the Swash channel, round by the North Sand Head"; but Tromp quickly closed that avenue of escape, and gradually, as his force increased, drew nearer to the Spaniards, until, by the 17th of October, he had them completely hemmed in, his fleet (then consisting of one hundred and ten vessels) coming to anchor in the Downs, outside of them, confident of an easy victory if the enemy could but be brought to an engagement; to do which without having to fight the English fleet as well became now his great aim, since "Sir John Pennington, his

majesty's admiral, who lay in the Downs with thirty four-men of war, had informed him that he had received orders to act in defence of either of the parties which should be first attacked."

In pursuance of his object, Tromp got into his barge, on the morning of the 19th of October, and deliberately sailed through the Spanish fleet, as if making a reconnoissance of its numbers, strength and position; a proceeding which (as he must have foreseen) so stirred up the irascible Spaniards, that one of their vessels fired at him, sending a ball just over his head, and through the boat's sail. The next day he repeated the experiment with better success; his boat being again fired upon, and one of her crew killed outright.

The opportunity he had been longing for had come at last, and the man of action was resolved to take instant advantage of it—a resolve which he was confirmed in by advices received from The States General, directing him to engage the enemy at all hazards, even though he should be obliged to fight England to boot. He now called a council of war, and arranged his plan of battle, and at the same time sent the bloody corpse of the slain bargeman alongside the English flag-ship, "that Pennington might see for himself that Oquendo had been the first to violate the rights of asylum granted by the King of Great Britain to all nations seeking shelter on his coasts." The body was accompanied by a letter, wherein Tromp informed the British Admiral that he fully expected him to call the Spaniards to account for violating England's neutrality, and that if he failed to do so, he (Tromp) would take the matter into his own hands.

On the morrow, at dawn of day, the Brederode fired a gun as a signal to the Dutch fleet (which was riding at single anchor) to commence heaving in. A second gun followed about sunrise, when the topsails were let fall from their yards, which had been previously mastheaded, and the head sails hoisted.

The Dutch fleet then stood for the Spaniards in five divisions, leaving a sixth division, under De Witte, to watch the English, in readiness to engage them should they venture to take sides with the enemy. DeWitte's force consisted, according to LeClerc, of twenty-eight, frigates and four fire-ships.

No sooner were the Dutch underway than the Spaniards cut their cables, and endeavored to get to sea, by the passage between the Goodwins and the South Foreland; and, as if to favor them in their design, a thick mist, which completely concealed them from the enemy's view, came driving from the land. It was but of brief duration,

however, and when it lifted, twenty-two of the Spanish vessels, which had ventured too near the coast, were observed to be hard and fast aground, "one of which was a great galleon (the vice-admiral of Galicia) commanded by Don Antonia de Castro and mounted with fifty-two brass guns." Upon these vessels the fire of the whole Dutch fleet was concentrated, until their officers and men were forced to abandon them—some leaving in boats and others jumping overboard and swimming for the shore—when a number of fire-ships were sent against them, and seventeen of their number destroyed.

The other vessels of the Spanish fleet succeeded in reaching the open sea; but were soon overtaken by the Dutch, and forced into a fight which ended in their almost utter annihilation. The accounts are conflicting; but the Count D'Estrades characterizes the victory of the Dutch as the most complete ever seen (la plus complete, qui se soit jamais vue) while the Spanish historian, La Fuente, deplores, in pathetic terms, the total defeat sustained by his countrymen. "The greater part of our fleet," he writes, "was either captured, burnt or sunk, including the ship of the line, the Santa Teresa, of eighty guns, commanded by the famous Don Lope de Hoces, in which was embarked the most select regiment of musketeers to be found in all Spain. Of this regiment not one man was saved. But why enter into details? The truth is we lost, in that action, the best of our *navy* in seamen—of whom eight thousand perished—as well as in ships, and that our maritime power suffered this crushing blow more, to add to the naval disasters of the two previous reigns."

Only seven Spanish vessels, of which one bore the flag of the admiral-in-chief, succeeded in making their escape into the friendly harbor of Dunkirk. Sixteen fell into the hands of the Dutch, together with four thousand five hundred men, including officers, soldiers, and seamen. The Dutch loss in ships was ten, of which there was not one but went down or burned up with its colors flying. Their killed, wounded, and missing numbered less than one thousand.

Such was the fate of the second Armada dispatched by Spain to the British channel, which, like the first, was governed entirely from Madrid; for Oquendo had strict orders from the Spanish Cabinet, not to fight the Dutch, but to take refuge in English waters, and thence to send, as best he could, the twelve thousand infantry embarked on his vessels, to some port in Flanders. This explains fully the otherwise unaccountable behavior of one who was esteemed by his countrymen the very best seaman of his day; and his dire defeat adds anoth-

er to the long list of battles lost through the interference of meddlesome politicians with the management, tactics, and strategy of commanders-in-chief. Yet, although Don Antonia de Oquendo was doubtless a good officer, the world will not be willing to accept him as a great one; for a great man in supreme command, whether by sea or by land, will never regard instructions, no matter whence they emanate, which, if rigidly carried out, must lead to the destruction of his fleet or army, the humiliation of his nation's flag, or the loss of his own or his country's honor.

The Spaniards complained bitterly that the English had behaved, on this occasion, more like enemies than neutrals, (*mas como enemigos que como neutrales*) and that they had set fire to many of their ships; and Campbell * admits that "the people of England were not sorry for this misfortune which befel the Spaniards, and the reason of this was that some surmised this to be a new Spanish Armada, fitted out nominally against the Dutch, but in reality intended to act against heretics in general." (5) He asserts positively, however, that the Court took "all the care imaginable" to preserve England's neutrality, and he is corroborated in this by Le Clerc, who says the castles at Deal "fired upon some of the Dutch vessels which approached too near the shore."

The truth is the Dutch were fully determined to attack the Spaniards, come what might, and the English were not in sufficient force to prevent their doing so.

A century and a half before this time, the expulsion of the Moors from Granada and the discovery of America had placed Spain in advance of all other military and naval powers on the globe. The thoughts of her people, which for seven hundred years had been bent upon schemes for the recovery of every inch of their beloved soil from Moorish dominion, were, now that this task was accomplished and a new field of adventure opened to them, turned into an entirely new channel. At first the idea which fired the Spanish heart was the conversion of the heathen, and the addition of vast territories to the mother land; and each Spanish vessel that ploughed the main, bound to the New World, carried among her crew a host of doughty cavaliers whose names were already inscribed on the roll of fame, headed by some pious friar who was destined, on countless battle fields, to carry his crucifix side by side with the banner of Castile: but as carrack, pin-

* Lives of the British Admirals.

nace, and caravel returned to Spain, bringing marvellous accounts of the *El Dorados* of the West, the cupidity of the Spaniard became aroused, and avarice usurped in his breast the place of the nobler passions; so that the waters encompassing the earth were everywhere white with the sails of Spanish ships in quest of gold, until it might almost be said that, braving all dangers and committing all crimes, in the unhallowed pursuit, Spain itself had gone to sea. Spain's fame as a naval power now (6) reached the four quarters of the globe, and, increasing with each decade, culminated in 1571 with the battle of Lepanto. From that epoch the prestige of the Spanish navy declined; yet, terribly lowered as it was by the failure of the Invincible Armada, it was not entirely lost—for men attributed the disastrous issue of that expedition to divine, not human agency—until, at the hands of the Dutch, on the 21st of October, 1639, it received its finishing blow. The prayers of the oppressed of two continents had reached the throne of the Almighty at last; and it might well be believed that an avenging God had decreed that in "the battle of the Downs the sin of the Spaniard should weigh heavily on his head, and the prophecy of Charles de la Croye meet with its complete fulfilment. "Mark you," whispered he to the Duke of Alva, whom he found at Antwerp gazing upon a brazen figure of himself, trampling upon the effigy of a man with two heads, (symbols of the noble and the plebeian of Holland,) "Mark you, these heads, grinning so horribly, will some day rise again, to take signal vengeance upon those who are now spurning them with their feet."

But, now that the Dutch had become a maritime power, their neighbors across the channel, who claimed "to rule the waves", became exceedingly jealous of them, while they, on the other hand, elated with their recent successes, chafed under England's assumption of superiority, and especially under her demand that "every Dutch ship should lower her flag and topsails to the ships of the kings of England in the British seas." The unreasonableness of this demand was very ably set forth, in 1608, by the learned Grotius, in his *mare liberum*—a tract to which, it may be remarked, Selden's *mare clausum* was but a feeble rejoinder —yet the English Government steadily adhered to it, and, as if to add to its offensiveness, accompanied it with a declaration that "the British waters extended from the Naze of Norway to Cape Finisterre at the north-western extremity of Portugal." This occasioned frequent collisions between the Dutch and English on their own coasts, while in the East Indies their vessels seldom met without coming to an engage-

ment. Nor were their contentions confined to the sea alone. On land many a bloody scene was enacted ; but the tragedy at Ambayna,—which from the ill feeling it stirred up in English breasts, was undoubtedly one of the exciting causes (7) of the wars between England and the United Provinces,—alone can claim a place in this history; and, in order that the reader may form an unbiassed judgment of it, I shall give both versions of the story. The English account is that, in 1619, a treaty was made between Great Britain and the United Provinces, wherein it was stipulated that, to avoid further disputes, the Dutch should enjoy two thirds of the trade of Ambayna and the English one third. In pursuance of this the English erected a factory in the island while the Dutch built a strong fort there.

In 1623, however, the Dutch, desiring to monopolize the spice trade, pretended that the English had formed a conspiracy with certain Japanese to capture the fort, and thereupon seized upon them all, and "without having other witnesses than themselves present," put them to horrible tortures, for the purpose of forcing them to avow that which they were determined they should avow. These tortures were as fearful as those of the Inquisition : the breasts of some of the accused "being filled with air until they were almost strangled, and their eyes ready to pop out of their heads, and the sides of others pierced with bars of red-hot iron which penetrated even to their entrails ; others again had the soles of their feet burned with lighted candles." Having in this way extorted a confession from the sufferers, which they forced them to sign, they cut off the heads of ten of them (who with their latest breath asserted their innocence) and, "under a specious show of clemency," discharged the rest.

The absurdity of the charge made against their countrymen, say the English, is shown by the fact that, while they and the Japanese combined did not constitute a force of over fifty men, the Dutch had two hundred soldiers in their fort, and eight stout ships riding in the harbor ; and that, even if they had had the foolhardiness to attempt such an act, they would have been deterred from it, from their certain knowledge that its comsummation must bring upon them "eternal infamy and the loss of all their goods, since their sovereign, who hated to the last degree a violation of faith, had consented that the Dutch should hold the island and build a fort on it." Furthermore they declare that the subsequent conduct of the Dutch, in seizing not only upon the factory at Ambayna, but of every other English factory in the spice islands, too clearly demonstrates that their intent, from the

beginning, was to get the whole spice trade into their hands; and that avarice alone led to the accusation against the English, and all the enormities that followed it.

On the other hand the Dutch allege that their countrymen of Ambayna had for some time observed that the Indians of the neighboring islands were carrying on a secret correspondence with each other, contrary to the promise they had given, and without informing a single officer of the Dutch East India Company of their action. That, finally, they had become so bold as to threaten to attack the Dutch and pillage their factories, and that many of them had been heard to declare that the fort at Ambayna would not be much longer in Dutch hands. This induced the Governor of Ambayna to proceed to Loehoe, with a number of armed shallops, for the purpose of overawing the nations and bringing them into subjection; but when he arrived there he found them with a fleet of boats, more powerful than his own, drawn up in battle array; and, far from giving him satisfaction for the insults offered to his people, they endeavored to provoke him to attack them, and, finally, forced him to retreat to Ambayna without effecting anything.

This boldness of theirs caused the Dutch to suspect that a plot was forming for their overthrow in the East, and that some European nation was at the bottom of it. Close observation convinced them that the Indians of Loehoe, Cambello, and other places, were entirely under the influence of the English: and, continuing their investigations with great secrecy, they learned, in February, 1623, from a Japanese who was concerned in the intrigue, that a conspiracy had been formed against the fort of Ambayna and against the whole Dutch establishment on that island. He named Captain Towerson, the head of the English factory, and Abel Prys, an English surgeon, as the prime movers in the affair, in which all the English were concerned, and declared that the fort was to be carried through the treachery of thirty Japanese soldiers, who were in the service of the Dutch East India Company and formed part of its garrison. The Japanese were now disarmed, and they, as well as the English, seized and imprisoned. They all acknowledged the conspiracy and signed their acknowledgement, "which one can see at length in their declaration, where, among other things, it is admitted that they intended to kill the Dutch governor."

When Towerson was asked what had induced him to engage in such a wicked design, he answered—"Honor and Profit." Being asked from

whom he expected to receive honor and profit and why he wished to seize the fort, he replied "I expected to be honored and rewarded by my country, as it was for her advancement that I was willing to peril my life in the enterprise." After his examination was concluded the governor said to him—"Is this, then, your recompense to me for all the friendship I have shown you?" "If the thing were to be done over again" he replied with a sigh, "I would not do it," which (if the relation be true) was certainly, as the Dutch say, "an admission of his crime."

At this distance of time it is impossible to form a correct judgment of the matter. The argument of the English that it would have been impossible for the conspirators to take the fort is certainly not sound, since, with thirty of their number already within its walls, nothing would have been easier.

It seems probable, then, that a conspiracy did exist, of which the Dutch were only too happy to take advantage as a pretext for seizing the English factories *everywhere.* Le Clerc indeed asserts that, according to the English historian Wilson, the Court of England attached more faith (*plus de foi*) to the Dutch than to the English narration; but in this he is not borne out by the text; Wilson's exact words being,—"This cruelty had made an incurable wound betwixt the two Nations (the Noise of it giving Animosity enough) but that it was new skin'd over, the bloody Garment taken off by Dutch Apologies, and presented at Court with a Face of justice; For nothing must come thither but in such Attire, as the Great Ones about the King will please to put upon it; who might be wrought to any temper by that Forge that could frame such flagitious Actions; For they that had Barbarism enough to perpetrate the one, had Baseness enough to practice the other."

While such was the state of feeling between the two countries the Parliament in England passed the celebrated navigation act (Oct. 9th, 1651) whereby all nations were prohibited from importing in their vessels any commodity "not the growth and manufacture of their own country." This act, although general in its terms, was levelled entirely at the Dutch, who, producing little, were the common carriers of the world; and yet the Parliament went further and granted letters of reprisal to Robert and William Pawlet (who declared they had sustained a loss of twenty thousand nine hundred and seventy pounds sterling from the cruisers of Holland) authorizing them to collect that amount, by the seizure of Dutch merchantmen and their cargoes,

whenever they might chance to fall in with them in "the narrow seas." This high handed measure produced such an outcry in the United Provinces that the States General found it necessary to dispatch a special embassy to England to remonstrate against it.

The ambassadors, who were granted an audience by Parliament, on Dec. 29th, were at once convinced that Cromwell, who had shortly before "longed for a coalition between the two republics which should make their interests inseparable," now as earnestly longed for war; still they had interview after interview with the Parliament, and did not wholly despair of peace until news reached them on the 19th of May that a collision had actually taken place between Van Tromp and the English admiral Blake, when, from the intense excitement of the populace, which made it necessary for the Council of state to provide them with a guard of cavalry for their protection, it was easy to perceive that hostilities could not much longer be avoided.

Van Tromp, it seems, when about to sail from Holland, with a fleet of forty vessels, for the protection of his country's commerce, was instructed by The States General, to use his discretion about lowering his sails and colors to any English men of war he might chance to fall in with, "provided he did nothing derogatory to the honor of The Seven United Provinces"; but he was expressly directed to prevent, at all hazards, Dutch merchantmen from being visited and searched by the cruisers of any foreign power whatever*. Being driven by stress of weather upon the coast of Kent, he anchored in the Downs, and finding a British squadron there dispatched two of his captains to its commander-in-chief, Major Bourne, to inform him that the storm had forced him to seek that anchorage and that as soon at it moderated he would put to sea again—Major Bourne sent a polite message to the admiral in return, say the Dutch, and invited the captains to take a glass of wine with him; but, according to Campbell, Allen, and other British authors, he had the rudeness to reply "that the truth of his story would best appear from the shortness of his stay." However this may be, Tromp left the Downs on the 18th of May, and steered to the eastward, intending, after a few days cruise in the North sea, to return to Holland for the purpose of providing himself with anchors and cables, of which many of his vessels were greatly in need; but he had not gone far when he met "two Amsterdam vessels, whose captains informed him that they had just parted company with seven merchant-men off Dover, which they feared would fall a prey to the English, as they

* See Basnage annales des Provinces Unies, Tom. 1, p. 253.

had observed twelve of the Parliament's war ships bearing down to communicate with them." Upon this, Tromp, in strict obedience to his instructions relative to the protection of Dutch shipping, stood for Dover Roads, where he observed an English fleet of thirteen vessels at anchor, the largest of which, the James, carrying the flag of rear-admiral Robert Blake, afterward so famous in English history, got underway and stood toward him. The situation was critical, and one of grave responsibilty—for in the excited state of men's minds both in England and in Holland a single false step might lead to war—yet Tromp acted with singular judgment, prudence and calmness, signalling to his fleet to furl all light sails and reef top-sails (that his vessels might be readily handled in case he should be forced to an engagement), and at the same time stationing men by his own ensign and flag in readiness to lower them when he should get within the proper distance of Blake. He was, indeed, he says in his letter to the States General, "about to give the order to 'lower away' when a ball from the James whistled above his head." To this he made no reply; but, upon being fired at a second time, he sent a ball across the James's fore foot, which was answered by a whole broadside, when the two flag-ships, the James and the Brederode became instantly engaged, (9) and the English fleet got underway. The action now became general, and the English were roughly handled until reinforced by Major Bourne with twelve vessels, when the combatants fought on more equal terms. (10) The battle was very hot, lasting from four to nine p. m., darkness at last putting an end to it. The English were terribly shattered in hull, masts, rigging and sails, and their loss in killed and wounded was quite as great as that of the Dutch, yet they properly claimed the victory as they took two Dutch vessels, while not one of theirs fell into the enemy's hands. One of their prizes, however, was retaken by Tromp, the morning after the fight; the prize-crew which had been thrown aboard of her, having abandoned her, through fear of her foundering.

The people residing along the sea-board of Kent were so alarmed when they witnessed the engagement, which, judging of the strength of the fleet from numbers alone, they supposed must inevitably result in the defeat of their countrymen, and a descent of the Dutch upon the coast, that they deserted their homes and fled into the interior; nor would they return to them until Cromwell himself appeared among them, with a large body of troops which he distributed throughout the county, placing strong detachments in Greenwich,

Gravesend, Sandwich and Dover. The voice of the nation, however, was for war, and the Dutch ambassadors, after many fruitless interviews with Parliament, (11) being convinced that it was inevitable, demanded their passports, and war was formally declared between the two nations on the 8th of July, 1652.

NOTES.

1 "Piet Hein," one of the most daring of the early Dutch Admirals, was the son of a poor fisherman of Delftshaven. He accompanied his father on several short cruises, in a herring boat, while quite a child, and, at a very early age, ran away from home and shipped in an East-India-man.

The exploit which gained him the greatest fame among his countrymen was the "cutting out" of a Spanish fleet at Matanzas, Cuba, laden with jewels and silver, valued at some two millions of pounds sterling.

He was killed in 1629, at the age of fifty-one, in an engagement with the pirates of Dunkerque; and Cerisier relates in his *Tableau des Provinces Unies* (Tome VI. p. 40) that the States sent a message of condolence to his mother on the sad event. "Ay, I thought he would come to no good end" was the honest woman's reply. "I did my best to reform him, but he would be a vagabond. I warrant you he has got no more than he deserved."

2 Lettre De Monseigneur le Cardinal de Richelieu á Monsieur le Compte d'Estrades. De Ruel le 15 d'Août, 1639.

Monsieur:—Je vous dépêché ce Courier sur des avis certains que j'ai, que le Roi d'Espagne assemble sa Flote à la Coroque, qui sera forte de cinquante grands Vaisseaux, commandez par Dom Antonis Dognendo, le plus habile homme de Mer qui soit en espagne il doit amener douze mille hommes d'infanterie sur des Vaisseaux pour débarquer en Flandres; l'escadre de Dunkerque so doit joindre à lui. Vous direz à Monsieur le Prince d'Orange de la part du Roi et de la mieune, qúel ne peut jamais trouver une occasion plus favorable pour la cause commune, qui celle de mettre promptement une puissante Flote en Mer, pour aller au devant de celle d'Espagne et la combattre, ni faire rien de plus glorieux pour sa réputation.

Comme ce Prince est lent de son naturel pressez-le de la part du Roi de donner ses ordres à tout les Amirantez d'equiper tous les vaisseaux qui seront en e′tat de servir. Vous l'assurerez en même tems, que le Roi a dépeché des Couriers à Calais, Boulogne, Deeppe, le Havre de-Grace, et Brest, avec des ordres aux gouverneurs, d'assister de munitiones de guerre, d'Hommes & de Vaisseaux, la Flote de Messieurs les Etats, pour les demander que celui qui commande la dite Flote leur en pourra faire.

3 Lettre de Monsieur le Compte d' Estrades à Monseigneur le Cardinal de Richelieu—Du 26 Août, 1639.

Monseigneur,

J'ai rendu compte á Mousieur le Prince d'Orange du Grand Armement de Mer qui se fait en Espagne, dont il n' avoit encore en aucuns avis;

mais le lendemain il recût un expres de Bruxelles, dépêché par le premier Commis de la Secretarie du Gouvernante Général, lequel il a gagné par des présens considerables et qui lui mande tout le detail des desseins des Espagnols.

Tout ce que Votre Eminence m' écrit y est contenu, excepté que Dom Antonio Doguendo ait ordre de rester avec la Flote aux Dunes, pour ne hazarder pas le combat et faire seulement passer l'Infanterié en Flanders par l'escadre de Dunkerque, assistée des Vaisseaux même du Roi 'd Angleterre.

4 Comme Tromp ne vouloit rien faire, que conformément à des ordres Exprès, dans une occasion assez délicate, il en demanda, touchant la conduite qu'il garderoit envers les Espagnols, s' ils demeuroient davantage sur les côtes d' Angleterre. Le 16 du mois, les Etats Generaux lui donnerent plein pouvoir d'attaquer la Flotte Espagnole, et de la chasser des côtes d'Angleterre quoi qu' il en pût arriver.—"*Le Clerc.*"

5 Campbell himself seems to have rather inclined to this belief, for no better reason than because "a popish book was produced in the next parliament, in which, among the superstitious things, were prayers for the holy martyrs who perished in the fleet sent against the heretics in England." It is evident, however, that these prayers were for the souls of the deceased heroes solely of the "*Invincible Armada.*"

6 When Drake took possession of Santo Domingo, there were to be seen in the Town Hall, among other things, the king of Spain's arms, and under them a Globe of the World, out of which issued a horse with his fore feet springing forward, with this inscription, "*Non sufficit Orbis.*"—"*Cambden's Life and Reign of Queen Elizabeth.*"

7 In 1623, happened the bloody affair of Ambayna, of which I shall give a short and fair account; because *it gave birth to our national hatred of the Dutch, which subsisted so long and had such fatal effects.—Campbell.*

8 While Cromwell and his adherents, on their part, were extravagant in their clamors for vengeance and satisfaction, in respect to the injuries and insults inflicted by the Dutch; the latter were no less vociferous in demanding restitution and reparation for those depredations which the ships of the former had almost piratically committed against the commerce and property of the latter, under the customary pretence of retaliation and reprisal. Neither party appeared to acquiesce in the propriety of the demands made by the other; ànd the mutual dissatisfaction which prevailed grew too violent to be appeased by any other means than an appeal, as is customary in all national disputes, to heaven for the justice of each individual cause, and leave the decision to that most tremendous of all umpires—the sword.—*Charnock.*

9 The official reports of the English and Dutch Admirals concerning this affair differ widely, yet I think the reader, who carefully collates the evidence on both sides, will arrive at the conclusion that the English were the aggressors.

Blake was under the impression, it would seem, that the Dutch were bearing down upon him with the intention to engage, and he was not one who was likely to receive an attack passively. Besides his blood was heated with wine (for he had been drinking with his officers in the cabin) and so, he was in no humor to suffer the Dutch to approach within gun-shot of him with their colors flying. "Which of the two was to blame" says Davies, in his history of the Netherlands, "it is impossible to decide. It may be doubted whether Tromp, a zealous Orange royalist was in any hurry to strike to an inferior number of the Parliament's vessels, or whether Blake exhibited much patience in waiting for him to do so."

10 Notwithstanding the numerical superiority of Tromp's fleet, it appears that, in the number and calibre of his guns, Blake was quite on an equality with his antagonist, while the English vessels were so much larger and more heavily built than the Dutch, that they could bear *twice the pounding*, and suffered less from splinters.

11 Il étoit visible par-la que les Fanatiques Anglois, malgre toutes les apparences de Religion, qu'ils affectoient avoient cherché cette guerre; quoi qu'ils 'ne parlassent qui de faire une Alliance avec les Etats, plus étroiete que toutes les précedentes. La dureté et la hauteur; avec la quelle ils traitoient la République des P. P. U. U. etoient tout à fait insupportables; D' autant plus qu'elle ne manquoit pas de flôtes, ni d 'Amiraux, pour opposer a l'Angleterre. On peut-même dire que si les E. E. avoient voulu d'abord équipper des Vaisseaux égaux en grosseur et en équipages à ceux des Anglais, comme ils le pouvoient; les Flottes de la nouvelle République n'auvoient pas pû tenir devant le leurs, comme on le verra dans la suite. *Le Clerc.*

SUPPLEMENT TO THE PAPER ON THE VENTILATION OF SHIPS.

See No. 13, Vol. VI. P. 237.

Since the publication of my paper on the Ventilation of Ships, which I had the honor of reading before the Naval Institute, on the 13th of April last, I have learned that the ventilation of the later monitors was not designed by Mr. Ericsson, but by Chief Engineer Isherwood, U. S. N., then Chief of the Bureau of Steam Engineering. I beg, therefore, to make the correction as early as possible.

The drawings for the ventilating machinery, conduits, et cetera, were made in the Bureau, and tracing sent to the different contractors, who were building the ships, from which they worked.

On board the *Montauk* class and the *Sangus* class the air was drawn down the turrets by the blowers and then forced throughout the vessels; but on board the *Miantonomoh* class it was taken in through a vertical armored cylinder which extended about ten feet above the deck, and was forced throughout the ships, finding an egress through the furnaces, galley and the turrets. By this means the gases from the fired guns were expelled from the turrets instead of being drawn into the ships.

G. W. BAIRD,
P. A. Engineer, U. S. N.

NAVAL INSTITUTE, BOSTON BRANCH,

SEPT. 30, 1880.

HENRY LYON, M. D., in the chair.

DISCUSSION.

THE LAWS OF HYGIENE AS APPLIED TO BERTHING, MESSING, VENTILATION, AND INTERIOR ARRANGEMENTS OF MEN-OF-WAR.

Naval Const. POOK:—I have been asked to say a few words on the subject of ventilation. I cannot think in what way I can do better than to give a description of the system of ventilation as arranged upon the Richmond, fitted at this navy yard, about two years since.

The Bureau of Construction had its attention called to the deficiency in ventilation upon ship board and, upon the representations of its chief, a board was organized by the Hon. Secretary of the Navy, consisting of Med. Dir. Turner, Naval Constructor Fernald, Comdr. J. R. Bartlett and Chief Engineer D. Smith. These gentlemen, coming to the Navy Yard, Boston, proceeded to arrange a plan as follows. A main duct was carried entirely through the ship, below the berth deck, which tapered from the centre of the length to the ends; when the engine room and coal bunkers were reached this passage was carried under the coal bunkers and out of the way of the machinery. Attached to this main pipe were smaller pipes which led into each room and stateroom of the ship; at the ends of these smaller pipes were placed brass registers.

The whole system was arranged to exhaust bad air from all parts of the ship, by the use of a fan blower which was run by a small steam engine at a high velocity. This was placed upon the berth deck. After the bad air was drawn out of the ship, it was passed under the berth deck, through square tubes, to vertical pipes, and into the open air—this was the exhaust method. Now, to supply the fresh air, pipes were arranged along the sides of the ship, wherever there was an opportunity to do so, with valves at the upper end, which could be kept open in good weather.

There was also a cowl of large size fitted on each side forward, which was placed so as to direct the wind into a port about two feet square; this port was boxed in, and was ultimately divided into three compartments, one of which led into the berth deck, another into the orlop, and a third into the hold. The port was fitted so as to be kept closed in rough weather, and the cowl arranged so as to turn around from the wind: at the after end of the ship, there were also fitted large, square ventilators, one from

the hold, the second from the orlop deck, and the third from the berth deck, all leading into a skylight upon the poop deck, which was arranged to close in bad weather.

It was the intention of the original Board, that the ventilation should be so arranged that the engine should not only exhaust the air, but draw it into the ship,—but this being the first execution of their plan, this part of the work was not perfected. Lately, Assistant Constructor Hanscom has originated a method which bids fair to produce the desired result. This consists of a series of valves so arranged that by one turn of a lever on deck, the engine can be made to pump the air into the ship, or exhaust it, as may be desired—the blower running constantly in the same direction. As it is not always desirable to have fresh air blowing into the room, Mr. Hanscom has introduced two registers, one at the lower part of the room, and the other at the upper,—that at the upper part being for the purpose of exhausting the foul air, and the one at the bottom for the supply of fresh air. This last plan has just been approved by the Bureau of Construction, and will be applied to the Hartford.

Additional ventilation was given to the Richmond, by the substitution of large oblong air ports, having lights nine by twelve inches on the outside, and flaring to openings nearly two feet square upon the inside. By this means double the volume of air that was formerly given to this ship was admitted.

Constructor Wilson has improved upon these ports by the use of a round port twelve inches in diameter, which is hung upon a hinge on the lower edge of the lights, and his attempt is to close the light by the use of a string and clamps or catches placed one on each side of the air port. The catches hanging loosely, hold the port something like the latch upon a gate, and the port is forced back upon its packing by the use of two nuts, one on each side. Mr. Wilson claims that the port thus closed will bear evenly upon the packing, and be made perfectly water-tight, the only objection being the time and the extra trouble it takes, to open the air port, which might sometimes be required to be done quickly. Wilson's ports will be applied to the Hartford, Lancaster and Brooklyn, and as many other ships as possible, it being understood that his port is adopted until a better one is presented. There is no question but that it is very desirable to have a perfect system of ventilation for our ships, particularly upon the berth decks, and no pains nor expense ought to be spared to bring out the best possible plans for their ventilation.

Chief-Eng. Trilley. I wish to inquire of Mr. Pook if the spaces between the deck-knees and planking under the spar-deck of the Hartford are to be left open?

Naval-Const. Pork. They will not be left open.

Comd'r Ames. Gum shellac, dissolved and mixed with yellow ochre so as to make a covering paint is the best possible covering for berth and orlop decks. Once a month two coats should be put on berth decks, which can be done between "after breakfast" and supper time, the men staying on the spar-deck. During the middle of the month spots where the most

wear occurs can be touched up. This treatment ensures a hard covering to the deck as easily cleaned and kept dry as marble, and with the proper use of whitewash overhead and good ventilation, as applied to the Richmond, I cannot see why a man-of-war should not be as healthful as any house. I have tried this system thoroughly on board the Kearsarge and Resaca with the best results as to cleanliness and health. I am pleased to know that Comd'r Schley, lately from sea, confirms these ideas in every respect with his own experience.

Commodore RANSOM. I believe that the use of shellac on lower-decks was forbidden by a general order from the Navy Department.

Naval Const. HANSCOM. It appears to me that the closing of these apertures is well enough as far as it goes but the fact is that our ceilings are by no means tight in the seams, and if foul air is confined in the frame spaces it will find its way into the state rooms and on to the berth-deck. What appears to me to be needed is some means of carrying the foul air up and outboard.

Naval Const. POOK. These openings on the berth-deck were formerly left as one means of preserving the timber of the ship. But at the present time it does not seem so necessary, as all or nearly all the timber applied to the naval ships at the present time has undergone a process of preservation. I can see no objection to closing all these openings, provided the process of preservation proves to be all that it is recommended.

Comd'r AMES. On board the Resaca the space under the floor was sufficient for a man to pass nearly the whole length of the vessel, and on this account her bilges could always be kept perfectly clean.

Dr. LYON. Is not that the way in which foreign vessels of war are usually constructed?

Naval Const. HANSCOM. They are generally built in that manner—what is needed in this respect is the raising of the floors of the hold. This would require but a small sacrifice of storage room, while it would make the bilges more accessible. Most naval officers know how difficult it is to keep clean the bilges in the afterpart of our screw sloops, in the shaft-alley et cetera, but with the floors of the store-rooms on either side of the alley raised sufficiently high, apertures can be made communicating from the shaft-alley to the bilges under these floors, thereby affording an opportunity to wash out thoroughly.

Naval Const. POOK. As an instance of the necessity of cleaning bilges, I would speak of the condition of the Monongahela just before her last cruise to the East Indies. When she came to New York, under command of Captain Fitzhugh, the odor on board the ship was intensely disagreeable and unhealthy, coming from foul bilges; at the request of the Captain the ship was docked, and the bilges were thoroughly cleaned, at the same time the store-room and magazine decks were raised, and every part was made accessible for cleaning. I think this cleaning was effectual.

Chief-Eng'r TRILLEY. The bilges of the Vandalia are very accessible, from the shaft-alley to the forward bulkhead of the fire-room. The boilers are placed at a height sufficient for a man to pass underneath. The trouble of

this vessel, from the bilge gases, on her first cruise, arose from the arrangement of the after magazine and store-rooms on each side of the shaft-alley. They were shut off from the shaft-alley by an iron bulkhead and the bilges were inaccessible, so that any foreign substance, lodging under the floors and decaying, caused the foul air to find an outlet into the ward-room state rooms through the apertures between the knees and the spar-deck planking. This was almost constantly occurring, and the smell from the bilge would be very strong in the ward-room when it could not be noticed on the berth-deck, in the engine room and shaft-alley. The boilers of the Hartford are placed very low and I do not think they will admit of a man's passing underneath. I wish to inquire of Mr. Pook, if iron beams were substituted for wooden ones, could not the boilers be raised several inches?

Naval Const. Pook. In regard to the space under the boilers of the Hartford for effectual cleaning, I think a portion of that valuable space is taken up by a series of plates, separated by spools and angle irons as a preventive against the effects of heat; but for these arrangements there would be ample room for cleaning; for instance, if the boilers were placed upon legs, like the Richmond's.

Lieut. Bassett. I think much can be done in promoting the hygiene of the ship by the Watch, Division and Executive Officers. It is difficult to teach some men to keep clean. Constant and unremitting attention are necessary to teach the apprentices in the training ships to keep themselves and their clothing clean. Men are a little better, but must be watched. Persons, clothing and bedding must be frequently washed and aired, perhaps the latter more often than in some ships. Bathing facilties should be extended. I do not mean to advocate large and well appointed bath-rooms, but I cannot see why, if, as in some ships, the firemen have bathing arrangements, a similar attention should not be accorded to the seamen. As to washing decks, I had imagined that nearly all the medical men took strong sides against it, as we have all heard that holy-stones were to be banished, et cetera. But in reading an excellent paper, read before the Institute, by Medical Director Gibbs, I find that he, at least, seems not to fear that the sailor would, as the old adage has it, suffer more from the water inside the ship than that out of it. But the deck should be dried thoroughly, and it would be better to let it go in bad and damp weather. Drying stoves should be frequently used, and every means taken to dry the deck well.

Comd'r Ames. On board the Pensacola, swinging tables were provided for the crew and were so arranged that in port they could be made solid, stationary tables by placing one of the end swinging supports underneath for legs. These tables gave great satisfaction.

Bag-racks were fitted on board the Colorado under the supervision of that most excellent officer Lieut-Com'dr, now Capt., L. A. Kimberly, and were fitted so that each mess had a rack; the key was always kept by the cook of the mess. This prevented stealing.

I consider lockers, bag-racks and swinging tables all in the direction of improvements in the condition of the sailor, and I feel that with properly shellaced, lower decks, and ventilation as arranged on board the Rich-

mond, all that can be done for the health and comfort of the crew in our present style of ships would be accomplished.

As regards the ration, I am firmly convinced that there is nothing which needs greater reform than the manner of putting up provisions for the navy. The manner in which stores are prepared for use in the far western posts of the army is far in advance of anything that we have, and ensures to both officers and men the best of provisions in almost perfect condition. A study of the methods used in the army purchasing office in Boston would amply repay any one interested in this matter.

Naval Const. Pook. The fitting of the mess tables, bag-racks, &c., is always optional with the Captain of the ship; but most of the ships which have been fitted where I have been, have been arranged without the racks and lockers, as was contemplated by the order of Admiral Porter, made sometime since, in consequence of the want of ventilation, and the dirt which will collect in spite of the utmost care, as well as being receptacles for bugs, mice and other vermin. The greater objection, however being deficient ventilation in those parts, and in consequence a rapid decay.

I have no doubt, however, that tables and lockers can be arranged, and all the parts thoroughly ventilated in connection with a general system of ventilation.

Lieut. Bassett. As regards the second section of the subject—Messing and Berthing—while we may regard Hygiene and Ventilation as belonging particularly to the Constructor and Doctor,—to line officers principally fall the duty of attending to messing and berthing. The executive arranges the details and the watch and division officers carry them out. As to berthing, I do not see why, if hammocks must swing so closely packed, they cannot be arranged so as to be less in contact. It is hard to see why men are healthy in fully manned ships, when they sleep in hammocks nearly touching, with rows dovetailed between, as closely swung. In iron-clads, on account of the high decks, this is easily avoided. But in our wooden ships why cannot an arrangement like this be made; let the odd numbered hammocks swing as usual up to the beams, while the even numbered, dovetailing between them, are suspended lower by rods so arranged that during the day they swing up to the beams like an iron stanchion. These rods could be fixed by pins and the hammocks hang from the ends of them. Thus there would be rows high up alternating with rows further down. As to messing it is time the old custom of making the men squat about on the decks be abolished. Swinging or folding tables should be used, and thus the men would be better able to eat, feel better over it, and be under better control. Some tables should be left down after supper, and the men allowed to read or write at them.

Lieut. Strong. I think that it would be difficult to place one hammock under another in our wooden ships, as proposed by Mr. Bassett, on account of the want of space between-decks. We all know how difficult it is to pass along a berth-deck under the hammocks after they are piped down. I agree with the remarks that have been made regarding the use of swinging tables and benches. They serve as a convenient place where men can

read and write, as well as take their meals, and any comforts of this kind which can be furnished to a ship's crew have in my opinion a tendency to make the men more contented and, in consequence, more efficient.

Comd. Schley.—During my cruise recently concluded on the coast of Brazil, west coast of Africa and the Home Station, embracing about thirty-eight months of which nearly twenty-three months were spent actually at sea in weather that was boisterous and often severe, I observed large additions to the daily sick-list of persons suffering with catarrh, rheumatism and other diseases that could be attributed to the decks below. Consulting with my medical officer it was agreed to shellac the berth deck of the ship. It was discovered that a very large reduction took place in our sick-list. My impression now is in the neighborhood of fifty per cent. It seems only fair to infer that it was due to the precautions taken below. In single deck ships as the Essex was, it appears to me hardly fair to the men to deluge the berth-deck at sea while the spar-deck was kept constantly wet by the elements. I have always been a great advocate of sand and the holy stone, but my experience in the Essex convinced me that it was a mistake so far as decks, where men live, are concerned.

With respect to the effect of clean bilges, I would say that while in Rio de Janeiro, in the winter months of 1878, I had several cases of yellow fever on board the Essex. Every case could be traced to the shore, but the cleanliness of the vessel, the crew, and her bilges made it impossible for the disease to secure a lodgment. The employment of rods, spoken of by Lieut. Bassett is practically reached now by long laniards which the men have spliced into the rings of their hammock clews. By this means the men in port where decks are the most crowded are enabled to swing each alternate hammock below the first tier.

The great height between decks in the more recently constructed foreign vessels admits the plan mentioned by Lieut. Bassett, but in our ships would be a serious inconvenience on decks that are now only high enough to allow for passage, while this is not the case in all our vessels.

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Captain H. A. Bartlett, U. S. M. C. in the chair.

ICE NAVIGATION,

By Lieut. Frederick Schwatka, U. S. A.

This subject, embracing in its whole extent the construction of ships —or altering of those that have seen less severe service,—for this peculiar employment, their management and direction under the various combinations of ice-packs, ice-floes, icebergs, tides, storms, currents, and other obstacles, when they have entered their frigid field of action, their care and preservation when securely anchored by the cold clutches of the ice, for the long dreary winter night of the Arctic, their liberation when the summer's sun has broken up the great ice fields, and their reënactment in inverse order of their former experience, as they prosecute their journey or return home, as will be more likely in the light of past Arctic adventures, can all be more fairly comprehended by following the history of such a vessel through all the above until its return to its native waters, or its crushing amidst the grinding pack or its final abandonment by a long beleaguered crew to the unyielding fetters of the frozen zone; to follow it from its launching back to its lucky laurels or from its dock-yard to its doom.

I will not dwell upon such indubitable facts as the quality of the ship's material, which it is evident must be of the very best, be it wood or iron, or, the almost equally apparent fact of the superiority of a vessel specially constructed for this purpose, in the hands of proper persons, who have had experience in Arctic navigation as well as naval construction over the reconstructed merchantmen or even stronger built man-of-war.

Nothing is more favorable to ice-navigation than a propitious season, and the history of the Arctic is replete with instances where different explorers, at different times, have found the most startling variations

in the state of the ice, in the same locality, and at the same corresponding time of the year. So well is this fact appreciated by experienced navigators of these waters that you will seldom find one give that credit to Arctic success which is so often so fully accorded by the press and the public. Rightly estimating that it was not altogether superior management over his more unfortunate brethren, but largely due to the fortunate circumstance of a lucky season, which is a problem defying calculation. Lieutenant Payer of the Austro-Hungarian expedition has pointedly said: "The commander of an expedition must possess sufficient self-control to return as soon as he becomes convinced of the existence of conditions unfavorable for navigation. It is better to repeat the same attempt on a second or even a third summer, than with conscious impotence to fight against the supremacy of the ice." Splendid as this maxim appears upon the face of it, it nevertheless has the weak point that it is based on things as they should be, rather than on things as they are, and should any Arctic commander, actuated by honorable motives, adopt such a course, he would probably find this maxim, when he returns home, exchanged for that one of Napoleon that "there is nothing so successful as success"; and should the same attempt be repeated on a second or third year it is more than doubtful whether he would find himself retaining his orignal position. It is often this unfortunate relation existing between an ambitious commander and his inexperienced countrymen at home that has done so much to add to that huge list of rotting hulks and human bones which form a necklace of honor around that pole they could not reach. But let us return to our ship and determine in the scales of experience of what material she shall be made. These tell us that the superiority of iron ships over those of wood no longer holds in the Arctic. The rapid conductive power of the former makes it almost impossible to keep an equable temperature in any portion with out a thick inside coating of some non-conductor, besides the more rapid formation of frosts from condensed moistures along the outer sides of the bunks, causing serious diseases, and greatly aiding the propagation of that most terrible of all Arctic scourges, the scurvy.

The superior strength and endurance of iron over wood in the usual accidents of the temperate and tropical seas seem to be lost when the test comes in the shape of severe pressure from the ice, the elasticity of the wood allowing it to return to its original shape after an almost indefinite number of nippings which are not sufficient to directly crush the vessel, while the same number of equal pressures in its iron com-

panion become slowly accumulative, until it finally succumbs. A wooden vessel, however, may be very properly plated with iron over the hull, for some feet under the water, to protect it from the grinding action of the "ice tongues," which are formed by the unequal melting of the edges of large ice cakes, and projecting their huge submerged points, often for a distance of twenty or thirty feet, become dangerous to a vessel compelled to thread narrow and tortuous channels and "leads" in an open field of pack-ice, where the first intimation of their presence is a low, dull, groaning sound, and a swinging of the ship, probably a half a dozen points of the compass, despite the helmsman, or probably a perfect arrest as the helpless ship comes up broadside on against the cake of ice, and with all sails thrown aback, if that be her motive power. Theoretically, therefore, iron ships are inferior to their weaker but more elastic wooden compeers, and this theory is ably demonstrated by facts in the sad fates of the River Tay in 1868, in Baffin's Bay, and of the Swedish exploring ship Sophia in the north of Spitzbergen; in both instances these vessels sank under circumstances where good wooden vessels would have survived.

Having decided to build a wooden vessel the shape of the hull is not a matter altogether of perfect indifference. The full round ship, or, nautically speaking, a ship with full lines is much more liable to be crushed by ice-pressure than one built with sharp lines, as fully illustrated in Koldewey's German expedition when the Germania, built upon the latter principle, stood the ice-nip without very serious consequences during a heavy storm, while her companion the Hansa was crushed and sunk, she being modelled upon the former plan, and this despite the fact that the Germania was the larger vessel and therefore more liable to destruction than her lighter escort. This last statement would bring us to a consideration of a proper size for an Arctic exploring ship, and while this may vary through tolerably wide limits, depending upon the equally diverse objects to which she may be put and the time she is to be employed in icy seas, still the general principle that a vessel should be as small as possible, compatible with the object in view, is a good one. The smaller and lighter the boat the easier she is to raise by the squeezing floes; and this lifting of a vessel from the glacial vice, in some cases completely from her element has been the salvation of many an ice beleaguered boat. The superiority that a large vessel has over a smaller one in its greater momentum, when called upon to "ram" the ice, so as to force a passage, is compensated by the fact, which experience has fully corroborated, that the large ship

will succumb sooner to these severe and repeated shocks that she is thus compelled to bear. It should be added that it is only when the floes are small, and the ice comparatively loose, that *any* ship, whatever may be her size, can ram it with any fair prospect of effecting a passage through. Again a small ship is more readily handled in the tortuous channels through which she is often compelled to thread her way while working in floes sufficiently open to just allow progress. While all Arctic authorities agree upon the employment of small ships, the exact size in tons is seldom stated, but in the few cases mentioned about four hundred tons may be taken as the maximum limit.

The charging, ramming, or pushing of ice, by a vessel, brings us to the consideration of the motive power most serviceable for ice navigation—steam or sails alone—for it is only by the former that charging can be made possible, except in these extremely attenuated packs where the headway of the sailing craft is sufficient to carry her safely through, but it must be added that such packs are seldom encountered. The use of steam may be laid down as a positive rule to be all important, despite the fact some few persons of no inconsiderable experience as Arctic navigators still denounce the waste of room occupied by the steaming machinery, its necessary fuel for so long a journey, and the almost triple anxiety imposed upon the commander regarding his propeller, which is constantly breaking its blades despite its protector of iron grating, and other derangements of machinery that may here become extremely difficult if not impossible of repair. The first attempt to use steam power in the frigid zone was essayed by Sir John Ross in the Victory, a small vessel of but eighty-five tons, which sailed from England in 1829, carrying sufficient coal for one thousand hours steaming. At that time the screw-propeller was unknown, and the Victory was fitted up with paddle-wheels, which proved so utterly worthless in the very first ice they met, which, added to an unfortunate accident which permanently disabled the engineer, and the constant attention the new machinery required, finally forced Ross to fall back wholly upon his sailing power, with which he continued his journey, at last abandoning the Victory in Prince Regent's inlet, the first he had lost of thirty-six vessels that he had commanded during forty-two years' service. This complete failure of the paddle-wheel in ice-packs, however slight, fittingly fixed their doom forever.

The first use of the screw-propeller was on Sir John Franklin's ill-fated expedition in the Erebus and Terror in 1845. How effectually they worked, like all other information concerning that party, is wrap-

ped in mystery. Certain it is Sir John Franklin came nearer accomplishing his object than any of his predecessors, but whether due to his propellers or to a favorable season can only rest on conjecture; suffice to say they were certainly not powerful enough to release him from his two years' besettal in the ice-packs of Victoria strait, unless the cause was due to a scarcity of coal. With the various improvements in propellers, especially in their protection and other adaptation to this peculiar service, came their more universal use in Arctic navigation; and at this date one seldom hears of an expedition to these regions not thoroughly fitted with this most essential auxiliary to a perfect success. By steam power only can a vessel defy the ever variable winds of those regions.

Running before a breeze and with a current in the same direction is the most favorable condition that can be secured for a sailing craft, not on account of speed which is thus facilitated (for a vessel in the ice should under no circumstances, be she steamer or sailer, exceed six or seven knots per hour, while three or four is not a bad average to adopt), but on account of the disjointed and open condition of the ice-pack that is produced by this state of affairs. Even in this most favorable state, if she be running towards the narrow portion of a funnel-shaped channel, she will more than probably encounter a gorged ice-pack at this point barring her further progress. A sailer caught in this predicament is in a very precarious condition. To attempt to return against both wind and current is sufficiently hard, as all sailors know, but when there is added to all this the incoming pack-ice, which will certainly add two to three and often four or five points to her lee-way, in constantly attempting to weather the large ice-cakes and often equally dense and larger ice-packs with fruitless results, the time lost in wearing her around or throwing her on the other tack when a channel open one minute has closed in her front, makes it almost if not quite impossible to return, and the grinding, crushing pack soon builds up to her position and encloses her under the most dangerous circumstances that can occur in ice-pressure, unless she can find an "ice dock" like that described by Dr. Kane, and even this, at any minute, is liable to be obliterated by an increase of wind or a pressure due to the accumulation of ice or change of tide. This state of affairs is, I think, more than probable, illustrated in the case of the besettal of Sir John Franklin's expedition, the Erebus and Terror, in September, 1846, off Cape Felix of King William's Land. Attempting to pass through Victoria Channel, whose southward trending current is at this point

greatly narrowed by the converging shores of Victoria Land on the west, and those of North Somerset, Boothia, and King William's Land on the east, his propellers worthless or his coal supply short, he must have encountered this ice-gorge so late in the year that his ships were almost immediately frozen in, or the summer's winds held him against or in the pack as already indicated. The latter reason seems to me very reasonable, for, during the time my party was on King William's Land, from the time the ice broke up in Victoria channel on July 24th, 1879, until the ice, newly forming, was sufficiently thick to stop a sailing vessel, which was about the middle or latter part of September, I was forced to notice an almost continuous North-North-West veering to North-East wind, evidently caused by the warm rays of the never-setting summer's sun heating and rarifying the atmosphere over the vast snowless plains of upper British America, whose place is filled by the denser air chilled by the great ice-fields of the Arctic ocean. That this Victoria channel is navigable under very favorable circumstances is shown by the fact that one of these two ships afterwards floated down or sailed through this strait to near the mainland of America, some one hundred and fifty miles, manned by not more than four or five men. On the contrary a steam-vessel may move or escape in any direction the only requisite being a sufficiently open pack. When the state of the ice becomes very favorable, and liable to remain so for some time, she may bank her furnaces, and with all the advantages of a sailing craft prosecute her journey, being ready to steam up at the very first threatening of any obstacle that would require the use of that power to overcome. Although good Arctic authority has said that "the making fast to a floe should never be attempted, except when every hope of navigating in the surrounding waters has been fruitless," and further adds, "as a principle, and so far as it is possible without the exhaustion of her powers, a ship in the ice should endeavor to be in constant motion, even though this entail many changes of her course and the temporary return to a position which had been abandoned," (Payer) still the latter suggestion involving, as it may for a great period of time, the consumption of coal, and in regard to the former suggestion, the many cases where vessels with banked fires have fastened to floes with their ice-anchors, ready to escape almost at a moment's notice, makes these cases of advice not strictly essential in steamers, if they be properly harbored under the lee of the ice. With a sailing vessel this resource becomes much more dangerous. The fastening to an iceberg is not altogether unattended with danger and

should only be resorted to when other means of safety are remote. The Polaris was justified, in such an instance, in seizing on to Providence Berg, although I have seen some contrary opinions expressed. A sailing vessel should only do this when it becomes necessary to avoid drifting into a more perilous position.

Again, a steam vessel can go into harbor later than one with sails, and this is of some importance considering the short season during which navigation is at all practicable. This arises mostly from the superior advantage in charging the newly forming ice of the early fall, or "young ice" as it is generally called. The action of a sailer in this "mush ice" is so well described by Sir Edward Parry, who had seen five Arctic expeditions, all in sailing craft, that I gladly transcribe it *verbatim et literatim*. "The formation of young ice upon the surface of the water is the circumstance which most decidedly begins to put a stop to the navigation of these seas, and warns the seaman that his season of active operations is nearly at an end. It is indeed scarcely possible to conceive the degree of hindrance occasioned by this impediment, trifling as it always appears before it is encountered. When the sheet has acquired a thickness of about half an inch, and is of considerable extent, a ship is liable to be stopped by it unless favored by a strong and free wind; and even when still retaining her way through the water, at the rate of a mile an hour, her course is not always under the control of the helmsman, though assisted by the nicest attention to the action of the sails, but depends upon some accidental increase or decrease in the thickness of the sheet of ice, with which one bow or the other comes in contact. Nor is it possible in this situation for the boats to render their usual assistance by running out lines or otherwise; for once having entered the young ice, they can only be propelled slowly through it, by digging the oars and boat hooks through it, at the same time breaking it across the bows, and by rolling the boat from side to side. After continuing this laborious work for some time with little good effect, and considerable damage to the planks and oars, a boat is often obliged to return the same way that she came, backing out in the canal thus formed to no purpose. A ship in this helpless state, her sails in vain expanded to a favorable breeze, her ordinary resources failing, and suddenly arrested in her course upon the element through which she has been accustomed to move without restraint, has often reminded me of Gulliver tied down by the feeble hands of Lilliputians; nor are the struggles she makes to effect a release, and the apparent insignificance of the means by which her efforts are opposed, the least just

or the least vexatious part of the resemblance." (Parry's second Voyage 1821-22-23.) A sailing vessel caught in this unfortunate state of the ice, must, as Parry says, immediately seek winter quarters in the nearest harbor, and if that be remote and the wind unfavorable or rather, unless it be extremely favorable, the crews will be forced to cut a channel the entire distance for the helpless ship. This Parry was forced to do in 1819, near Melville Island, the channel cut being nearly three miles long. On the contrary with steam power, ice only a half an inch thick is an insignificant obstacle and a vessel thus equiped can steadily force her way through such a thin sheet, while even that proportion of a yard can easily be overcome by charging, requiring only well strengthened bows. Another great advantage of steam over sail power is in the case of a calm with a strong tidal or other current setting towards an ice-pack or stranded iceberg; the salvation of the latter depending upon the relative power of the current and the strength exerted by her small boats to tow her off, while the easy escape of the former is obvious. Also, in the early and late navigation of these waters, the sails are liable to become completely clogged with ice and sleet, rendering them, in extreme cases, impossible of manipulation. This state of affairs nearly proved fatal to the Griper, Captain Lyon, Royal Navy, in September, 1824, in north Hudson's bay, while attempting to battle with a terrible two day's storm, the sleet forming over a foot thick on his decks and proportionally over other parts of the vessel. I should not have entered into so long a discussion on the seemingly palpable superiority of steam power over that of sails, was it not for the fact that such a great proportion of the Arctic expeditions are of a private nature, wherein the means of the liberal donor or donors can not reach the increased expense of steam machinery and fuel, and the undaunted ambition of the contemplated commander, officers, and crew, accept the situation rather than await the vacillation of government aid. Our vessel having filled as many of the above requisites as possible, and being on her way, accompanied by a transport,—if she be a steamer—whose stores of coal and other articles are to be transferred when the ice becomes dangerous for such a craft (presumably not strengthened for that purpose) we will, no doubt find her encountering her first true Arctic experience in iceberg navigation, especially if she be heading against some of those great polar currents which sweep by glacier-bearing lands. In the Atlantic, the great oceanic base for by far the larger number of Arctic expeditions, these monster mountains of ice sometimes reach as low as 40° N. Lat. They are to

be dreaded mostly in the night or sometimes in very heavy or very foggy weather. This danger, therefore, steadily decreases as the ship nears the pole, and near the Arctic Circle when she will encounter perpetual daylight, it ceases. It is in the lower latitudes, and especially during dark, foggy nights so common to these regions that the sharpest look-out must be kept, and here also the berg meeting more temperate waters and warmer climate is, in its disintegration widely surrounded by a vast debris of smaller masses most of which are equally as dangerous as the parent berg.

There is one peculiarity of icebergs that is fortunate for those cruising in their vicinity, and that is their visibility at quite long distances during the darkest nights and the heaviest of weather. I remember on the 10th of July, 1878, while making for the eastern entrance of Hudson's strait, and while off the Labrador coast, our second mate, a keen-eyed Scotchman, caught the faintest glimmer ahead, during a misty, thick fog, about 2 o'clock in the morning, when daylight had hardly commenced to break. He estimated it to be about three miles away, and wearing ship and laying to, we discovered in the morning that his conjectures were about right. This monster colossus of ice was flanked on either side by its debris for three or four miles, some of the pieces standing fully as high as the foremast of our little schooner. To my unseamanlike eyes, even with the aid of a powerful marine glass, I could only make out what seemed to me to be the very slightest break in the dark, inky clouds hugging the horizon, and the mate told me that the navies of the world, a score abreast, could have passed half way between us, and Argus himself would never have seen them. It is the peculiar sheen of their polished faces that penetrates so far, and under circumstances where a bank of snow or a ship's sails of the same size would be invisible. If a ship is approaching icebergs and their accompanying fragments, repeated observations made by plunging a thermometer into a bucket of water drawn from alongside soon shows the fact by decreasing temperature; and these observations are more valuable in the summer than in the winter months, and also the farther south the ice may be encountered, owing to the more rapid change in the observed temperatures under these circumstances; but, as all Arctic navigation is performed in the brief summer of these regions, and as it is only in the lower latitudes that the nights, at this time, are sufficiently long to cause apprehension, these observations become doubly valuable. In the winter season, if the temperature of the water falls as low as 34° F. from a previous higher standard, it may

reasonably be inferred that ice is not much farther away than half a mile, and due precaution may be taken accordingly. 42° F. would show about the same distance in the summer time, the thermometer falling rapidly as the vessel approaches. It should be remarked that the thermometer shows a higher temperature in the deep than in the shallow water on banks, shoals, and near the coast line, often falling from 2°F. to 6° F. as the latter are approached. But a good chart and a fair degree of accuracy in dead reckoning will avoid confounding this with the decrease due to approaching ice. After the ice has been passed, although it may not have been seen, owing to the darkness or weather, this fact is soon revealed by the little detective by a rise of its mercurial column. There are many instances recorded where vessels, by an attentive series of these thermometrical observations, have escaped destruction in the iceberg regions, and I am sorry to state that there are other instances of disaster that could, no doubt, have been avoided by a timely recourse to this simple expedient. In the case of an iceberg stranded in a current, it is evident that even this valuable sign will fail on the current-washed side, as the chilled waters are swept away in the opposite direction as fast as formed; so that when a vessel is running with an ocean current where a berg is liable to ground, or, where from its great depth, the berg is subject to some more powerful under-current than exists on the surface, the only safeguard is in a vigilant lookout. A sailing vessel should never approach an iceberg too closely if there is danger of becoming becalmed, especially in warm waters, as there disintegration if of a colossal nature is sufficient to throw the largest ship on her beam ends if taken at a disadvantage. Sir John Franklin had the ship's pinnace of the Trent, thrown ninety-eight feet by the disruption of an iceberg, about a half a mile distant, which so completely stove the craft that they were forced to a very annoying delay to repair it before they could return to the ship. This rupture had been determined by the firing of a musket by one of the party. Even if there be a good wind there is considerable danger, in running under the lee of a large berg, the eddying of the wind forcing the ship upon the ice.

The next difficulty that our Arctic voyagers will encounter will be the outlying ice-packs, and much of this subject has already been described in discussing steam power *versus* sails. The commander now has probably the choice of two methods of reaching his destination, or rather two routes, one of which is to keep well out to sea, if the breadth of the channel will permit, and the other is to hug the shore-line like

the little coasters plying between near ports. This subject, like that of steam, seems to be pretty well settled at this hour and in favor of in-shore navigation. Practically illustrated by Barentz, Henry Hudson, Baffin, Sir John Ross and others, including the whalers constantly visiting these climes, it was reserved for Sir Edward Parry to bring the matter in such prominent light before the public as to provoke the most bitter discussion, revive all previous experience on the subject, and institute the most thorough investigations for the future, with the above results. Of this subject, he says, after returning from his first voyage: "Our experience, I think, has clearly shown that the navigation of the polar seas can never be performed with any degree of certainty without a continuity of land. It was only by watching the occasional openings between the ice and the shore that our late progress to the westward was effected; and had the land continued in the desired direction there can be no question that we should have continued to advance, however slowly, toward the completion of our enterprise." In his second voyage he reiterates substantially the same opinion. So necessary was the continuity of land considered by the British Lords of the Admiralty, after Parry's able practical deductions, that several expeditions were by them fitted out to explore the Arctic coast-line of the North American continent, to determine this shore in order to more intelligently direct a vessel through the north-west passage in conformity with this idea. One of the greatest advantages of coast-water navigation over that more remote is the assurance of a winter harbor should the young ice form so rapidly as to prevent further navigation, a not unusual circumstance in these regions where the change of season is short and decisive. Another consideration on in-shore navigation I will give in the words of its author, Lieut. Payer, who says: "A strip of open water which retreats before the growth of the land-ice only in winter, forms itself along coasts, and especially under the lee of those exposed to marine currents running parallel to them; and this coast water does not arise from the thawing of the ice through the great heat of the land, but from the land's being an immovable barrier against the wind, and therefore against ice currents. The inconstancy of the wind, however, may baffle all the calculations of navigation; for coast water, open as far as the eye can reach, may be filled with ice in a short time by a change of the wind. Land ice often remains on the coast even during summer, and in this case there is nothing to be done but to find the open navigable water between the extreme edge of the fast-ice and the drift-ice. Should the drift become

pack-ice, the moment must be awaited when winds setting in from the land carry off the masses of ice blocking the navigation, and open a passage free from ice, or at least only partially covered with drift-ice." It is evident that navigation in coast waters must be slow and gradual, though it has always been attended with the greatest advantages. Still another important advantage of coast water navigation over that remote from land, and which I do not see mentioned by any Arctic authority, is in the fact that if the body of water in which the vessel be cruising is of considerable extent and ploughed by ocean currents, the ice well out to sea does not become fixed nor solidly frozen during even the severest winters, and a vessel thus embayed is at the mercy of the ice-packs and currents, at a time when even if she were liberated the intense cold of that season would make it rigidly impossible to manipulate her, and, in fact, a liberation under these circumstances would be the very last thing to be desired. The Tegetthoff in her memorable drift was thus fortunate, and Sir John Franklin's ships had the advantage that Victoria channel, through which it seems they attempted to take the middle course, is suffieiently narrow to freeze from shore to shore, and prevent the miseries of a winter's drift. Sir George Back, in the Terror, drifting through Fox channel and Hudson's strait in the winter of 1836-37, did not fare so well; and his terrible sufferings, unable to house his vessel in snowbanks which were constantly torn from his ship's sides by the ceaseless disruption of the ice-fields, as fast as made, and many times forced, during heavy gales, to hastily abandon his ship, with a scanty supply of clothing and food in the Arctic winter night, expecting the crushing of his vessel in the whirling, upheaving floes, by his experience shows plainly the great extent of misery and sufferings which a crew may be called upon to bear when not safely harbored for the winter. In-shore navigation is not without its hindrances, however, and especially is this the case where the water near the coast is very shallow, and this which could be only remedied by a light-draught vessel, has the disadvantage that such a vessel can not conform to the build already indicated. This is peculiarly the case on the Polar shores of the mainland of America, Asia, and Europe, while in the channels and waters north of them, the land rises higher, the navigable water approaches more closely to the shore, and progress forward becomes more easily assured. Also in coast water cruising, a vessel forced upon the shore by the incoming pack-ice, backed by a heavy gale, is in a more precarious state than one simply grounded or lifted upon an ice-field.

A ship once fairly beset and strongly held during a gale is completely at the mercy of the elements, and there can be no real good accomplished by the severe tasks of warping and continual shifting of ice anchors which only exhaust the crew and render them more or less unable to take a thorough advantage of a favorable situation should one occur. Parry, however, under these circumstances did not hesitate to employ his crews to their utmost at the hawsers and sails plainly acknowledging that "the exertions made by heaving at hawsers, or otherwise, are of little more service than in the occupation they furnish to the men's minds under such circumstances of difficulty; for when the ice is fairly acting against the ship, ten times the strength and ingenuity could in reality avail nothing." But the greater majority of ice navigators are now decidedly of the opinion that it is best to yield to fate and reserve the men's strength for palpable efforts. Still, in these besettals, the mind of the commander must be ever active, for now events follow each other so rapidly, that a favorable chance for rescue is passed before it can be fairly weighed in all its aspects. Sir John Ross aptly describes such a situation when he gives a scene in his Arctic experience during a heavy gale with his ship the Victory in the ice-pack of the Gulf of Boothia: "The attention is troubled to fix on anything amid such confusion; still must it be alive, that it may seize on the single moment of help or escape that may occur. Yet, with all this, and it is the hardest task of all, there is nothing to be done, no effort to be made. The navigator must be patient, as if he were unconcerned or careless, waiting as he best can for the fate, be it what it may, which he can not influence nor avoid."

A ship may winter in the ice under somewhat varied circumstances. She may be drifting in the pack during this time, unable to make a harbor, as in the cases of the Terror, Tegetthoff, Fox, and others; or she may be frozen in in the hammocky pack but not subject to drift although not in harbor, or she may be safely ensconced in some good sheltered haven. In the first case, the most dangerous of all, but fortunately the least numerous since the employment of steam, nothing can be done but await events. A northward drift is a most perilous circumstance, and although in the only case on record—that of the Tegetthoff—the crew managed to escape, it was only by a miraculous combination of favorable events. It is this fact solely that has led so many Arctic expeditions to follow that continuity of shore land which is swept by southward trending currents in preference to all others. Many Arctic sailors of experience have even strongly contended that it

is a matter to be at once considered, when a ship is thus probably circumstanced, if she should not be immediately abandoned before the northing gained would seriously compromise all hope of escape. In a winter's drift it is impossible to properly "bank" a vessel, as the encasing with snow-walls is generally termed, and it is consequently a severe labor to keep an equable temperature in the unprotected ship. In the case of the unfortunate Tegetthoff, Payer says, that "while in the berth close by the stove, there was a temperature ranging between 100 F. and 131 F., in the other, there was one which would have sufficed for the North Pole itself. In the former a hippopotamus would have felt himself quite comfortable, and Orel, the unhappy occupant of it, was often compelled to rush on deck, when the ice-pressures alarmed us, experiencing in passing from his berth to the deck a difference of temperature amounting to 189°F. In vessels properly "banked," on the contrary, no such variations of temperature need be encountered, even in the severest weather." This "banking" is most conveniently done by Esquimaux, when their services can be secured, as their superior ingenuity in snow construction enables them to enclose the vessel in even several concentric snow-houses thus securing the most complete and equable temperature, with the least amount of material, which is quite a consideration when this monstrous mass has to be removed in the spring in order to float the ship.

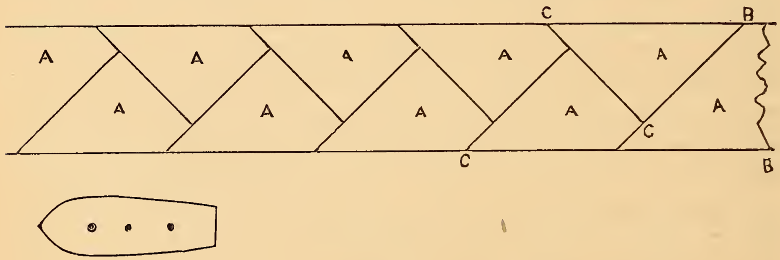
"It is an ill wind that blows nobody any good" and even the drifting winter-beset ship has some advantages in this condition which it would not be uninteresting to note. If drifting towards more temperate waters, as is generally the case in following the more usual routes, she is almost certain of a safe and speedy release in the early spring months, and the constant state of alarm experienced by all ships crews while in these involuntary journeys, from ice-pressures and threatenings of a general destruction of the ice-fields has almost its compensation for good in the necessarily banished *ennui* and lonesomeness of the long polar night with its accompanying evils of idleness and disease. Forced activity to overcome lonesomeness soon wearies, loses its effect and becomes really a punishment, while that prompted by danger never loses its stimulating effect while based upon the inherent dispostion to self preservation.

A vessel wintering in the ice, unable to secure a harbor, but not subject to drift, may be subject to much danger when the fields break up in the following summer, and this danger will generally be greater the farther she is from land, owing to her earlier liberation, probably

long before the navigable season may commence. In a vessel far from land much of the benefit derived from the voluntary exercise indulged in by the crew by short rambles, hunts, etc., especially in the early spring and late autumn when it is of the most value, is necessarily lost.

A vessel safely anchored in a good harbor is necessarily in the most favored condition of all. She may unbend her sails, lower her yards and topmasts, presenting a mimimum of surface to any gale, while awaiting her freezing in, which is especially necessary when the character of the bottom of the harbor is such that there is danger of dragging the anchor. Once frozen in securely, the anchor is raised, the rudder cut out and unshipped, and all these with the stores and provisions may be placed on the shore conveniently by and there room be made for the winter's entertainments, exercises and studies. A vessel is then "housed in" which is done by building a shed over the upper deck with lumber brought for that purpose. This house should be about seven feet high, the lumber covered with canvas, this with a layer of moss or turf six or eight inches thick, cut in the early fall before it has frozen, and dried as much as possible, and this layer of turf again covered with from three to four feet of snow, which should be continuous with the snow walls or snow heaps placed along the sides of the ship. Light is secured by large, thick blocks of ice placed in the sides of this "house" at convenient intervals. If turf or canvas is not employed the temperature of the "house" must be kept below the freezing point or the continual melting of the snow forming pools of ice on the ship's deck will be disagreeable in the extreme; also, a housing solely of canvas, as has been often employed, prohibits the use of a thick layer of non-conducting snow or turf, and, except during a wind, it is but little better than no protection at all. The housing should extend the whole length of the ship if possible, but if cut short at the middle portion, a not unusual method to save lumber, the exposed deck should be treated to a covering of snow and turf similar to that placed on the house. Where moss or turf is not to be had fine sand is almost equally good, but is much heavier and can only be used on horizontal or slightly inclined surfaces. The importance of securing a winter harbor near where Esquimaux can visit the ships is not to be over estimated. The clothing procured from them is far superior to any that can be manufactured in civilization for withstanding the severe temperatures of those regions; their companionship does much to alleviate the lonesomeness of the winter's solitude, for they are generally a most cheerful, merry hearted, and contented race,—their services in procuring game

from both land and water to keep the crew in a healthy state and especially to combat the scurvy is apparent, while in case of disaster their humble abodes are always open to the shipwrecked sailor until there can be convenient times for retreat to reach more civilized succor—a retreat in which the white man may be greatly aided by the native method of transportation. A fire hole being dug in the ice near by which must be opened every morning and evening, and a snow house thrown over it, if natives are convenient, to protect it from drifting snow, and our ship is ready to pass her Arctic winter unmolested until the coming summer opens a renewal of her labors. Should the circumstances of the case warrant an early start in the season, it will probably be necessary to cut a very long channel through from six to ten feet of ice of sufficient dimensions in length and width to float the ship to the outer open water. This channel is generally constructed as shown in horizontal projection in the following figure.



The channel B. B. B. B. is always brought up *alongside* the ship, as shown, since should she draw more water than the thickness of the ice, and the channel be brought up immediately under her, the outgoing tide or a strong wind might sweep her out before it was intended she should move. The scarf lines CC. CC., formed in sawing, are sufficiently intelligible to be understood without an explanation, the ice-blocks A. A. A, being allowed to float out along with the ebbing tide, a single person directing each one as fast as sawed off to prevent its rotation and consequently binding in the channel. If the vessel delays her starting until after the solar rays have made considerable impression on the ice of the harbor, it will save much labor to remove the snow along the contemplated scarf-lines of the channel, and place thereon a covering of black seaweed, sand, dirt, or ashes which will have cut deeply into the ice by the time the sawing is necessary. These layers, of course, should be very thin, otherwise they will protect the

ice instead of acting as ready conductors of the sun's heat. A little funnel-shaped harbor with but few projections along its converging sides may sometimes be relieved of all its ice at one time by a small amount of sawing along these serrated edges and a happy combination of tide, wind, and good management. This is especially the case where the rise and fall of the tide exceeds the thickness of the ice, the consequent vertical oscillation of the ice keeping it broken up in hummocky masses along the shore line. The use of blasting apparatus has so far been of but little use, wherever used, still I think a series of small charges, fired electrically, giving rather a pushing than a concussive effect, might be used advantageously in removing quite large masses of obstructing ice. Blasting, I believe, would also be more efficacious in harbors not fed by fresh water streams, as here the ice is more brittle, less tenacious and elastic, and consequently harder to remove by the percussive power of explosives. The difficulty of sawing increases in a rapid ratio with the thickness of the floe, and when its depth becomes so great as to allow a play of but a foot or two with the ice-saws it becomes essentially impossible. Ice-saws if very thick impose severe labor on those operating them by their great weight; if thin, they will warp and cramp in the thick ice, also creating severe labor. As all these contingencies cannot be foreseen it is desirable to have quite an assortment of these utensils varying in length and weight. A sailing vessel can nearly wait until she is liberated by the forces of nature, as this will probably be the earliest date at which she can take advantage of the season owing to her peculiar motive power. While a vessel is certainly safer when in harbor, this position may not always be without its dangers. She may have entered such a haven during an exceptionally open season and unless this recurs within the limit of time allowed by the ship's provisions she must be abandoned to save the lives of the crew. Such was the experience of the Investigator, abandoned in 1854, in the Bay of Mercy, Bank Sand, by Mc Clure of the Royal Navy, while on a search for Sir John Franklin.

It would be a useless waste of time to go into the various advantages derived from employing two ships instead of one wherever the funds available will allow such a course. It proved the salvation of Parry on his third journey and other instances are not wanting. They should both be provided with equal motive power, steam or sails, in order to prevent separation. The use of balloons to make slight ascents—they being made fast to the ship—to enable the ice master to obtain a more

comprehensive view of the state of the ice, has never yet been experimented upon, though by many recommended, and consequently cannot be either rejected or accepted as an auxiliary in this sort of cruising. Certain it is, however, that nothing is more deceitful than ice packs or ice drifts at a distance, the most invulnerable looking, upon a closer examination, proving to be the most disjointed oftentimes, and the reverse.

Although from this rather long list of probable Arctic accidents to which a ship is exposed escape would seem rare, yet after all it is wonderful the small number of craft actually lost in this dangerous species of navigation, in proportion to the whole number engaged.

The compass, that all important little guide in more favored zones, here becomes almost practically useless. In North Hudson's bay and strait, and, in general, near the magnetic pole, its sluggish oscillations are easily overcome by the most insignificant local attraction, which it is impossible to avoid upon shipboard. The farther removed from this great center of magnetic force, necessarily the more reliance can be placed on the needle. While in this district the direction may be approximately determined by a watch or chronometer rated to mean local time conjoined with the well known uniform motion in azimuth of the sun which, barring cloudy weather, will be continually in sight during the twenty four hours during the greater portion of the voyage. This direction will be sufficiently exact for a navigation which after all depends rather on the bearings of the "leads" and ice barriers than on any determinate points of the compass. The fact that a vessel should follow a continuity of land, as already described, lessens the value of this instrument while capes and headlands can be kept in view.

PRIZE ESSAY

1880.

NAVAL INSTITUTE, ANNAPOLIS, MD.

FEBRUARY 18, 1881.

Rear-Adm. G. B. BALCH, U. S. N., in the chair.

The meeting having been called to order, the Cor. Secretary, Prof. C. E. Munroe, stated that he had received from the honorable Secretary of State, the eight essays forwarded to him in Jan. 1880, by Lieut. J. C. Soley, at that time Secretary of the Institute, together with the following letter:—

"The undersigned to whom it was referred to examine the essays submitted in competition for the prize offered for the best, by the Naval Institute, having performed the duty with which they had the honor to be intrusted, award the prize to the essay identified by the motto, '*Sat cito, si sat bene.*'

Washington, Feb. 10, 1881.

W. M. EVARTS,
R. W. THOMPSON,
J. R. MC PHERSON.

Prof. Chas. E. Munroe,
Cor. Secretary U. S. Naval Institute,
Annapolis, Maryland."

Prof. Munroe further stated that the Executive Committee had resolved to postpone discussion upon the Prize Essay until it had been printed and distributed, and upon his motion the thanks of the Institute were tendered the gentlemen who had so kindly acted as judges. The envelope bearing the motto designated was then opened, and the name of the successful competitor announced.

THE NAVAL POLICY OF THE UNITED STATES.

BY LIEUTENANT CHARLES BELKNAP, U. S. N.

"*Sat cito, si sat bene.*"

I.

The extraordinary attention paid of late years by the leading powers of the world to the condition and efficiency of their navies leads to a belief that there is a growing tendency to greater reliance than heretofore, in case of war, upon this arm of a country's defence. It is not only among the leading powers of Europe that this change is taking place, it has spread to South America; and even in China and Japan, the navy appears to be the main weapon for offence or defence.

Under such circumstances, and when we find it commonly believed abroad that the United States was compelled to acquiesce in the demands of the Spanish Government for the settlement of the Virginius affair, on account of its inability to cope with the Spanish naval force of seven armored vessels, it is well to inquire into the condition of our own Navy, and to suggest such changes in our naval policy as will best tend to the proper development of our naval strength, in order that our again being placed in such a false position before the eyes of the world may be prevented.

In treating such a subject, the question naturally arises, Is there any necessity for the maintenance of a strong naval force by the United States? At first sight, separated as the country is by its geographical position from the rest of the world, and freed by its state policy from foreign complications, the maintenance of a powerful Navy seems an useless expense. And, moreover, objection has been made on the score of the consequent danger to the national independence. In the words of the talented historian of the United States Navy, "In a democracy there exists a standing necessity for reducing everything to the average comprehension, the high intelligence of a nation usually conceding as much to ignorance as it imparts. One of the worst consequences, in a practical sense, of this compromise of knowledge is to be found in the want of establishments that require foresight and liberality to be well managed, for the history of every democracy

has shown that it has been deficient in the wisdom which is dependent on those expenditures that foster true economy by anticipating evils and avoid the waste of precipitation, want of system, and a want of knowledge." And I believe the latter objection is advanced rather as an excuse by the high intelligence of the nation for its concession to ignorance than as a real reason for the policy of neglect so long observed towards the Navy. Rejecting, then, this objection as barely worth noticing I will venture to state what seem to me ample reasons for the maintenance of a strong naval force by the United States.

The necessity for the display of a naval force can never be foretold. The navies are the police of the world at large, and events are constantly happening where peace and good order are best maintained by instantaneous and determined naval intervention. Instances will undoubtedly present themselves to every one, but I may be permitted to refer to a few. The prompt action of Capt. Ingraham, of the U. S. S. St. Louis, at Smyrna, in 1853, in regard to Martin Kozsta, emphasized the determination of the United States to defend the rights of its adopted citizens abroad; and that it prevented, to a great extent, future complications on the same account is more than probable. The subsequent voting by Congress of a gold medal to Capt. Ingraham is sufficient proof that the Government will always appreciate the conduct of an officer who acts fearlessly upon his own responsibility where the honor of his country is involved. United States vessels have frequently interfered for the protection of life and property and the preservation of order, when the local authorities have been powerless, in Honolulu and in Panama. For the same reason, the Spanish iron-clads, in the hands of a piratical rabble from Carthagena, were seized by the English fleet and turned over to the proper authorities. The opportune appearance of the U. S. S. Adams saved a Chilian colony from pillage and destruction, and the arrival of an English gunboat put an end to the merciless slaughter of the Virginius prisoners at Santiago de Cuba. Many more cases might be cited, but these few selected at random will, I think, prove that the necessity for the employment of a naval force is most pressing when least apprehended.

That commercial and naval supremacy are coexistent is undeniable. The great commercial power of the world has always, for the time being, been also the great naval power, and history teaches us that when the naval supremacy of a nation has been overthrown the decay of its commerce has followed as an inevitable result. For a period of some forty years preceding the breaking out of the late rebellion, the skill

of our ship builders and the wise administration of the scanty funds appropriated by Congress for the use of the navy furnished us with a few specimens of naval architecture unsurpassed by any in the world. During the same time our merchant marine bade fair to wrest the lion's share of the carrying trade of the world from the hands of our great commercial rival. The war that followed offered an opportunity for the destruction of our merchant marine, which was not neglected. Privateers fitted out by our generous rival, on behalf, and sailing under the flag of the Southern States, pounced upon their unprotected prey, and the question of commercial supremacy was settled, for a half century at least. By an experiment at Hampton roads, in 1862, the war settled another question,—that naval architecture was revolutionized. Since then the Government has, in its naval policy, slept the sleep of a Rip Van Winkle, and now, awakening, it vainly endeavors to answer the demands of the present age with a navy suitable to the wants of a past generation. Our share of the carrying trade of the world is lost, and until we show ourselves strong enough to protect it, we may rest assured it will not be regained. The increasing influence of the agricultural and mining interests of the West in our national councils, and the disregard paid to the commercial interests of the East; the spread of the use of iron and of steam in merchant vessels; the sharp competition by numerous and heretofore unheard of rivals; all these reasons may be advanced for the decline of our commerce, but I hold that the inability of our Navy, on account of the inadequacy of its force, to protect the merchant vessels sailing under its colors, was the chief cause of capital's seeking safety under other flags.

Intimately connected with this is the influence exerted by a strong naval force upon nations having no merchant marine of their own, and especially upon those which are commonly, though not always with justice, termed semi-civilized. The commerce of the Pacific Ocean which lies along such a vast extent of our western coast, naturally should be ours, and in the same manner it might be expected that intimate commercial relations would exist between us and the two great Eastern Empires. But despite our proximity the United States flag is rarely seen off our western coast, and our trade with China and Japan is barely enough to employ two lines of steamships, sailing triweekly. And one of these lines even is under a foreign flag. The reason for this lack of intercommunication is evident. The mind of the oriental is influenced, not by theories, but by facts, and, though

the United States Government may be respected and esteemed for its policy of non-intervention, if not of sympathy, trade is gained and influence exerted in China and Japan by the nations keeping a powerful naval force on their coasts. I am strongly of the opinion that, incidentally, the restoration by the United States of indemnity funds unjustly exacted from those countries and, particularly, the maintenance in those seas of a large naval force authorized to lend its moral support to prevent the bullyings they are constantly subjected to, would do more to restore American commercial interests in that quarter of the globe than would the removal of any of the existing restrictions upon commerce that might be suggested.

The recent suggestion made by one foreign government that it might under certain contingencies interfere in the existing war between the South American republics, and the attempt about to be made, under the auspices of another, to build a canal across the Isthmus of Panama, recall to mind a state policy formally announced in 1823, and commonly known as the 'Monroe Doctrine.' By the moral force of that doctrine the Spanish Colonies of Central and South America were materially aided in gaining, and have since been enabled to retain their independence. The withdrawal of the French troops from Mexico and the subsequent downfall of the mimic empire erected by the government of Napoleon III. at a period when internal dissensions threatened the permanent disruption of the power which promulgated that doctrine, were caused by a reassertion of its principles, after the war, by the late Mr. Seward, at that time Secretary of State. Can it be that the Monroe Doctrine, so intimately allied to the foreign policy of the United States, though apparently well-nigh forgotten, is to be allowed to sink into utter oblivion? Are we prepared, in contravention of its principles, to allow one foreign power to interfere for the avowed purpose of humanity between combatants on this continent; and another to assume control of a canal, the unfriendly possession of which would be a standing menace in time of war? We cannot be so lost to the dictates of humanity that we do not care, at the proper time, to offer our intervention for the purpose of preventing the further useless waste of blood and treasure. We certainly are more interested than any other nation in the completion and control of an inter-oceanic canal, and, if it be demanded by the commercial necessities of the present age, we ought not permit any nation to forestall us in an enterprise of such vital influence upon our future welfare. I believe that free and extended discussion upon these subjects would

show that the American people as a unit demand the rigid maintenance of the principles of the Monroe Doctrine. Yet to be able to do this effectively a navy must be maintained, and I need not say that by a navy I mean something more than what we now possess under that name. Under the present circumstances, we are likely to see the principles of non-intervention by any foreign nation in the affairs of the American continent, a policy we have never disavowed, violated at any moment, in contempt of our views, by some strong naval power whose interest conflicts with our own. With what heart then could the Secretary of State protest against foreign encroachments, well knowing he had no force behind him to rely upon when protest failed? If the present penny-wise policy in regard to the Navy is to be continued, it would perhaps be preferable, while we could, not quite disgracefully, to withdraw from the stand taken, and in that way avoid possible disagreeable complications with a power possessing half a score armored sea-going vessels. For such action we have, unfortunately, precedent in the most extraordinary policy pursued by the Government in the early part of the century, when, with a foreign trade that employed over half a million tons native shipping, Congress, for the declared purpose of preventing it from being subjected to depredations by the belligerent powers of Europe, passed a law forbidding any vessels to leave port for any foreign country! The idea of protecting our shipping by means of a strong naval force seems to have been unthought of.

If then a strong navy be desirable in time of peace, how much more so is it in time of war. Our early experience should teach us that the proper observance of the rights of a neutral can only be forced upon the belligerents by the presence of a powerful naval force. It is extremely doubtful if either the French or English government would have become involved in hostilities with the United States had the latter, by maintaining a navy worthy of the name, showed a determination to protect itself. And would it not have been truer economy to have been so strong upon the sea as to have avoided the war with France, in 1798, and the war with England, in 1812, and the consequent expenditure of so many lives and so much money? Moreover it is extremely probable that, in any future war which may arise between the maritime powers of Europe, the first and second articles of the treaty of Paris, in 1856, will be annulled. These articles abolished privateering, and declared that the flag of a neutral protected enemy's goods, with the exception of contraband of war, from cap-

ture. Belligerent nations, their own shipping being liable to capture, will be forced to take this step to prevent their carrying trade passing into the hands of the neutral powers. At present, a very large percentage of our exports is shipped to Europe in foreign bottoms. A war breaking out there would throw the principal part of this to us, as being neutral, provided we showed ourselves willing and able to protect our ships from illegal exactions and capture. The embargo act of 1807 could hardly be repeated in 1880, and the other alternative would be to strengthen the Navy; but if we begin to make preparations during a foreign war, and any preparation in the present state of our Navy would be extraordinary, it would very likely, if not considered a *casus belli* by one of the combatants, be thought unfriendly at least, and apt to give rise to future unfriendly relations. In the hopes, then, of regaining our own carrying trade at the earliest opportunity, we ought to maintain such a naval force that, upon the breaking out of war between foreign nations, we should be able, without extraordinary exertions, to send enough men-of-war to act as convoys to our merchant vessels in all parts of the world. And by doing this, in addition to the advantage gained from announcing our intentions beforehand, we would have the satisfaction of knowing that we were at the same time providing the best safeguard against a repetition of the difficulties which led to the wars of 1798 and 1812.

In fine, though I cannot claim to have exhausted the subject, I trust I have said enough to show that the unsettled condition of society in the less civilized parts of the world; the depressed state of our maritime interests; the enforcement of the principles of the Monroe Doctrine and of our neutral rights, all demand the maintenance of a strong naval force, and I now purpose inquiring to what extent the present force maintained by the United States answers to that description.

II.

It may be gathered from my preceding remarks that I do not consider the present condition of the matériel of the Navy one from the contemplation of which much satisfaction can be derived. Even the Honorable Secretary of the Navy, who, from his office, is expected to view all naval short-comings through a roseate atmosphere, says in his last annual report, "The largest part of the Navy, however, is composed of vessels of the old types, and while some of them possess excellent qualities and are equal to any in the world, of the same types,

yet the Navy as a whole cannot be brought up to the modern standard of naval architecture until we shall avail ourselves of existing improvements."

The men-of-war of the present day are so far superior to those of the last century that it is scarcely to be doubted that two or three of them could defy the combined navies that fought under and against Nelson. In fact, owing to the increased power of manœuvring due to the introduction of the twin screw; to the greater resistance to projectiles on account of the increased thickness of the armor in which they are clad; and to the enormously increased range and destructive power of the ordnance they carry, the development, since the first were built twenty years ago, has been wonderful. A swift, armored ship, with heavy guns and skilful gunners, is nearly the equal if not the superior of the fort, which affords a stationary target, and moreover some of the recently constructed foreign men-of-war are to carry heavier guns than are mounted in any fort in the world.

Let us suppose now that the United States should become a belligerent, and the record of the few past years shows that this is by no means an impossible hypothesis. In such a case the war would necessarily at first be carried on at sea. And here let me say, that for some reasons, I think the part which the Navy took in the late war between the Northern and Southern states, though so highly creditable to the skill and courage of the personnel, was perhaps as great a misfortune as could have befallen it: for the nation generally is firmly persuaded that it has at any time like Glendower but to call spirits from the vasty deep, and a navy will appear. It is perhaps unnecessary to point out that the Southern states had no navy and that in any foreign war in which the United States might become involved, the conditions would be entirely different. The construction of armored sea-going men-of-war, requires in addition to time, skilled workmen, and larger rolling mills than are now to be found in the United States; and, besides, the modern men-of-war are so different from those we now possess, both in management and in the ordnance they carry, that long practice would be required before they could be skillfully manœuvred, and careful training would be necessary to prevent the mechanism of the guns and carriages becoming disabled, in the haste and excitement of action, by the manipulation of inexperienced gunners. Notwithstanding these considerations, we go on year after year, blindly trusting our naval defences to a navy, "the largest part of which is composed of vessels of the old types"!

The non-professional enquirer, upon learning that there are one hundred and forty two vessels composing the Navy of the United States, is apt to be too easily deceived by the figures. Let us look over the list, and, striking off those which are virtually worthless for war purposes, find out what really constitutes our naval force. In the first place twenty seven tugs and twenty two sailing vessels must be deducted from the one hundred and forty two, leaving ninety three to be accounted for. Of these ninety three, sixty seven are steamers of all classes, twenty four are iron-clad batteries or monitors, and two are torpedo boats. Of the sixty seven steamers, four are on the stocks, never having been launched, eight are old paddle wheel boats, seventeen of various classes are in different stages of decay, but principally so rotten as to be unworthy of repair, one is a tug converted into a gunboat and another is a despatch vessel; all of which should be deducted, leaving thirty six. Out of these thirty six, a dozen or so might be picked which have sufficient speed to overhaul an ordinary merchant steamer; the remainder are too slow to run away and too lightly armed to defend themselves should they fall in with a man-of-war of the improved type belonging to an enemy. Of the twenty four iron-clad batteries three are said to be on the stocks, but I believe they either have been or are about to be broken up; one, the Roanoke, is utterly worthless, and, though borne upon the register, is commonly believed to have been broken up by a former secretary of the Navy; one, the Puritan, has never been finished, and five are undergoing repairs which require considerable time and expense for completion. Excluding the two torpedo boats as being simply experiments, and including the five monitors undergoing repairs, we have nineteen iron-clad vessels to be added to the thirty six wooden steamers, making the total force amount to fifty five vessels. I need hardly say that in speed, with one or two exceptions, in ease of manœuvring, in thickness of armor plating, and in weight and penetrating power of projectiles, all these monitors are far surpassed by the more modern type of sea-going armored vessels, and their main reliance in time of action would be upon the small target they would present, and upon the hope of a chance shot crippling in some way their more powerful adversaries whose armor they could not penetrate.

We have then the astonishing spectacle of a nation of fifty millions of inhabitants, occupying a position midway between the two great centres of population of the world, with a commerce that needs the electrifying influence of a powerful navy to stimulate it, with a policy

of non-intervention in the affairs of its continent by foreign nations, and with an enormous coast line and innumerable ports to be protected, relying for its defence upon the navy I have described, which, whatever may have been its value twenty years ago, is to-day, on account of the inferiority of its ships and ordnance, barely noticed in calculations in regard to the relative strength of the navies of the world. The peaceful dissipation of the threatening clouds that have from time to time obscured our political horizon has given rise to a widely spread optimism in regard to our future welfare; but is there no danger in trusting too much to the manifest destiny of the Republic? Will nothing but the quickening effect of a heavy war indemnity awaken us to the necessity of maintaining our national defences in a high state of efficiency?

III.

Of the claims of the Navy upon the people of the United States, I need hardly speak; the recital of its deeds forms some of the most brilliant pages of our country's record, yet, as we review the treatment the Navy has received, we find its history presents an almost continual struggle for existence. One of the necessary concomitants to the contests of political parties in the United States seems to be a demand for economy in the expenses of the Government, especially after any period when extraneous troubles have materially increased the national expenditures. This cry for economy has generally been satisfied by the decimation of the very branches of service upon which the country relied for its preservation and defence. Thus, every time that there has been occasion for the employment of a naval force, it has been necessary to create it, using the small nucleus regularly maintained as a leaven to the mass. The necessity past, the additional force has been discharged, the material purchased has been either sold at a great sacrifice or allowed to fall into decay, and the normal state of *res angusta domi* has resumed its sway in naval affairs.

But apart from this there is, I think, another reason for the illiberal policy shown towards the Navy. Evidences are not wanting that upon several occasions of late, the national legislature would have been willing to make ample appropriations for the purpose of increasing the efficiency of the Navy had they been persuaded that a fixed policy would be adopted which would bring about the desired result. Or, to give expression to the idea, it seems to have been about as fol-

lows: "If you, officers of the Navy, can agree upon some settled policy which will best tend to the development of our naval strength, we, members of the naval committees of Congress, shall not be found wanting in the proper spirit to aid you to accomplish the effect." The lack of unity shown in the recommendations of the multiplicity of advisers has succeeded in so bewildering the members of the committees that, Micawber like, they have postponed all action from session to session in the hopes that something would turn up. On account of this, and in order that a definite naval policy may be adopted, which the Bureau system seems to have failed to accomplish, I venture to recommend the reëstablishment of a Board of Naval Inspectors, or Commissioners.

Naval operations during the Revolutionary war were naturally of an isolated and desultory character, and the small naval force formed was disbanded upon the conclusion of peace. From that time until 1798, the direction of such naval operations as became necessary was entrusted to the War Department. Despite the creation of a separate department for the management of affairs of the Navy, in 1798, the war of 1812 found the country almost wholly unprepared for sea warfare, and it was not until the Navy had shown itself by several brilliant actions worthy of trust that Congress was induced to grant appropriations for increasing its efficiency. Nevertheless, the preparations came too late, and the close of the war found the Navy driven from the sea, its ships captured, destroyed, or blockaded by overwhelmingly superior forces of the enemy. The wisdom of entrusting the direction of a navy to officers, fitted by profession and experience to judge of its requirments, became so apparent that, in 1815, Congress created a Board of Inspectors, three in number, which, under the superintendency of the Secretary of the Navy, was charged with all the duties of the department relating to the collection of materials and supplies, and to the construction, equipment, armament, and employment of vessels. There was no rotation in office, the naval committee of the House of Representatives, rejecting a proposal to that effect, in 1820, on the ground that it would prevent "securing the accumulating experience and talent of our naval commanders." The success of the management of naval matters by this Board soon became apparent, and the Navy attained a state of discipline and efficiency which, perhaps, has never been surpassed. In 1842, however, the Board of Inspectors was merged into the present bureau system. The increasing business of the Navy Department may have rendered imperative the establish-

ment of sub-departments for the proper consideration of matters coming under its cognizance, but there was no call for the abolition of the Board of Inspectors, and the wisdom of the step taken is questionable. As a result, we have, to-day, seven separate and distinct bureaus, each working independently, and following out the ideas of its own head without regard to the plans of the others. The lack of unity consequent to this arrangement, and the necessity for a superior controlling power, have on many occasions been only too obvious.

I recommend, therefore, that a board of commissioners be established as an Advisory Board to the Secretary of the Navy. At the same time the Secretary of the Navy should be given a seat in each House of Congress; in either of which he could, when necessary, appear personally to answer interrogatories in regard to the Navy, and to propose, explain, and advocate measures calculated to increase its efficiency. By this arrangement, the Secretary of the Navy, who is not, ordinarily, conversant with the details of the Naval Service, would have a board of officers, selected for their professional attainments, ready at any moment to give him the benefit of their knowledge and experience; while the Navy would have, what it so greatly needs, a statesman, eloquent and ready in debate, to defend it in the Houses of Congress against the attacks of unwise economy, and to advocate those measures upon which its future welfare depended. The Board should be composed of the senior admiral on the navy list, presiding officer ex officio, and of two other officers, of a grade not lower in rank than commodore, to be selected by the Secretary of the Navy and appointed by the President. The Board should have the power of selecting, as secretary, an officer of a grade not lower than commander. It should hold its meetings at Washington unless otherwise directed by the Secretary of the Navy and the members and secretary should be entitled to the sea pay of their grades. The evils inherent to the bureau system being now counteracted, the Bureaus should be maintained and the chiefs should be held responsible for the economical and thorough execution of such work as would be entrusted to them. The Board should have power to call upon the chiefs of bureaus for the information they naturally as specialists would collect.

After such a long period of inactivity, our policy should be to advance as rapidly as consistent with safety. Radical changes, except where necessary for the cure of existing evils, should be avoided. The conservatism natural to a board constituted as I have recommended would prevent too much innovation on the one hand, and attain increased

efficiency on the other. Appropriations should be husbanded, and unexpended balances at the end of the year should be turned not into the treasury as at present, but over to a general construction fund, which should also receive the sums accruing from the sale of condemned stores and vessels. The attention of the Board should at first be given to determining the best means for satisfying our requirements, (1) for the naval defence of our coasts and sea ports; (2) for the protection of our commerce and the destruction of an enemy's; (3) for the destruction or capture of the men-of-war of an enemy; (4) for carrying the war into an enemy's country.

(1) The determination of the best means of defending our coasts and seaports would involve a thorough course of experiment and investigation in regard to torpedoes, steam rams, and floating batteries. Officers of the line, stationed at or in the neighborhood of the different naval stations, should be required to thoroughly acquaint themselves with the approaches from seawards, and to suggest the most advantageous positions for the placing of sub-marine mines and torpedoes, and for the concentration of the means of naval defense; in fact they should be expected to prepare careful plans for the defence of the naval stations and the adjoining seaports. In this connection, I would recommend that no officer of the line, be promoted to the grade of lieutenant until he has passed through the course of instruction at the torpedo school; and, after the lapse of a suitable time, the same restriction should apply to those now occupying the grades of lieutenant, lieutenant-commander, and commander.

(2) Enquiries as to the best means of protecting our commerce, and destroying an enemy's, would involve the selection of the best type of a vessel for a cruiser, which would combine speed with economy of fuel and at the same time carry a sufficiently powerful battery to defend itself against the corresponding class of an enemy's vessels. Also the methods of convoy sailing, and the points to which cruisers should be despatched upon the declaration of war, for the purpose of capturing an enemy's merchant vessels, should be discussed. Lists of merchant vessels capable of being converted into swift, light-armed cruisers should be kept. As coal in time of war is virtually contraband of war, the question of coal supply and coaling stations would be a necessary adjunct.

(3) By far the most important question to be decided by the Advisory Board would, however, be the selection of a model for the construction of an offensive, sea-going, armored man-of-war. Upon this

point there is such a conflict of opinion, some eminent authorities claiming the superiority of topedoes over iron clads, others as strenuously advocating the claims of the steam ram, that only after careful and patient investigation, and calm and mature deliberation could a decision be arrived at. The rival claims of torpedo, ram, and iron-clad would first be considered; and if, as I think, the palm were awarded to the iron-clad, the questions of iron-clad ship construction and of armor plating, the material, the manner of fastening, the angular inclination, the thickness of plates and their manufacture;—these questions and many more, intimately allied, would require careful reflection. The kind of gun, ammunition, and projectile, the style of carriage, and the manner of delivering the fire would require a continued series of experiments before determination.

For the purpose of encouraging discussion and stimulating enquiry, the Advisory Board should be empowered to offer, annually, or even semi-annually, suitable rewards for prize essays upon these and other subjects so intimately connected with the future of the Navy.

The experiences of the leading naval powers of Europe for the last fifteen or twenty years in the construction of armored men-of-war, and the series of experiments in the contest between guns and armor, though by no means ended, would materially aid us in arriving at satisfactory conclusions. And I recommend the appointment of a naval officer, as naval attachè to each of the legations maintained by the United States in Europe, in order that we may obtain early and trustworthy information in regard to all matters going on of interest to the naval service. The officers to be selected for this important duty should have, in addition to the special qualifications of suitable rank and of familiarity with European languages, professional attainments of a high order. They should take advantage of every opportunity offered to make themselves acquainted with the naval strength of the country to which they are accredited and with the details of all experiments in which naval materials or implements are concerned, embodying the results of their observations in confidential reports to the Advisory Board.

(4) The custom of imposing heavy war indemnities upon the conquered combatant seems to have become prevalent of late years in Europe; and, consequently, the immense advantage to be derived from the occupation of a portion of an enemy's country as a pledge for payment, can be readily seen. Plans of naval campaigns should then be prepared, involving combined naval and military operations against assailable portions of an enemy's territory. Lists of merchant vessels

capable of conversion into transports should be made and constantly corrected, and the manner of marine counter-mining and of removing torpedo obstructions should be thoroughly discussed. In addition, officers on foreign stations should be required to thoroughly familiarize themselves with the approaches to the various ports visited, their means of defence, and the best positions to be occupied as points d'appui for operations against the surrounding country.

In addition to determining a policy to be followed by the United States in regard to these most vital questions, the attention of the Advisory Board might be turned with advantage to the consideration of matters of minor importance. The Board should require careful estimates for the repairs of naval vessels and in any case where the cost of such repairs would exceed one half the original cost of the vessel, the vessel should be broken up or sold, and the proceeds devoted to the fund above mentioned.

The uniform for the officers and men of the Navy as now established should not be changed except by Act of Congress, upon recommendation of the Advisory Board. With such a law in force, the body of officers and men composing the Navy would not be compelled to make a change in their uniform, unless the advantages to be gained therefrom were greater than the satisfying of a caprice of a few individuals.

Again, the Advisory Board, after a careful consideration of the laws passed by Congress, should compile a complete system of rules and regulations for the government and discipline of the Navy of the United States. The want of harmony at present existing among the different branches of the naval service is well known, and that it detracts from the efficiency of the Navy as a whole, is undeniable. This lack of concord so necessary to the prompt and efficient execution of duty is partly due to the existing ill-digested and self-conflicting set of rules and regulations by which the Navy is governed, but more so to the evils arising from special legislation by Congress. All special legislation in regard to individuals, and branches of the Navy should be stopped and no such bills should be considered by the Naval Committees of Congress except upon the favorable recommendation of the Advisory Board, or, failing that, of the Court of Claims. The rights and duties of all officers and men being, then, clearly defined by law, and the hopes of individuals or branches of selfishly gaining advantages over others, by special legislation, being cut off, the former harmony which

existed among the various branches of the Navy would be restored and the efficiency increased in a corresponding degree.

To briefly summarize, the first step in the future Naval Policy of the United States should be the establishment of a Board of Naval Officers, which, under the supervision and direction of the Secretary of the Navy should consider and determine :—

(1) All plans for the construction, alteration, repairs, equipment, and armament of the vessels of the Navy.

(2) A system of rules and regulations for the government and discipline of the Navy.

(3) Plans for naval campaigns, both offensive and defensive.

(4) Minor matters affecting the welfare of the officers and men of the Navy; and all claims requiring legislation for the benefit of individuals or branches of the Naval service.

They should also collect and compile, ready for reference :—

(1) Information in regard to the naval strength of foreign nations.

(2) Lists of merchant vessels suitable for transport service, or for conversion into light-armed cruisers for destroying an enemy's commerce.

(3) The number and capacity of private ship-building yards, iron-works, and rolling mills.

(4) And any other information likely to be serviceable in time of war.

The question of promotion is always, in time of peace, one difficult of solution. The many years that must pass before the casualties incidental to the service enable a young officer to gain his promotion are apt to deaden the ambition which should urge him to keep abreast the wave of advancement which appears to be sweeping over the present era. As an incentive to emulation and self-improvement, I venture to recommend that the present system of promotion by seniority be so far modified as to allow every third promotion to a grade to be made by selection from the officers, having a required amount of sea service, in the grade next below that in which the vacancy occurs. Again, this would in a few years enable the selection of two members of the Advisory Board to be made from officers who had advanced themselves by constant application and by devotion to the details of their profession. In order, however, to make vacancies on the active list, I recommend that officers be permitted to retire, at any time after ten years sea service and a course of instruction at the torpedo school, upon half pay. A number would annually avail themselves

of this privilege; promotion would be more rapid, and a Naval Reserve would be formed upon which the Government could in case of emergency rely for service afloat or for torpedo duty ashore.

For want of other employment, warrant officers are frequently detailed for duty on board vessels already too cramped for the proper accomodation of their crews. From causes too obvious to mention, the man-of-war of the present age is so different from that of last century, that the necessity for the retention in the service of the grades of boatswain, sailmaker, and carpenter, no longer exists. These grades should, then, be allowed to lapse by not making any appointments to fill vacancies. The care of the battery and small arms of a vessel alone being of sufficient importance to require the services of a warrant officer, the grade of gunner should be retained, and all applicants for the position should be required to pass a thorough examination to prove that they have sufficient intelligence and capacity to understand the mechanism, and to take the proper care for the preservation of the improved weapons now in use. By thus dispensing with the services of these one hundred and forty two superfluous officers, a sum sufficient for the pay and maintenance of over six hundred men would annually be gained.

The difficulty of obtaining seamen to man our vessels, during the late war, was seriously felt. We cannot rely upon merchant seamen, for the class has through so many causes become so deteriorated as to be generally worthless; and so large a proportion are foreigners that they cannot be depended upon to fight for the country that employs them. While the raw recruit may in a comparatively short time be converted into the disciplined soldier, the sailor is made only from the boy. The number of training ships should be increased and twenty five hundred boys, at least, enlisted in addition to the regular complement of the Navy. Each man-of-war going into commission should take a certain proportion of her crew from the boys on board the training ships who have shown most aptitude for a sea life. In this way a reserve of seamen would gradually be formed, for although these boys after the first cruise might not remain in the Navy, in case of war they would naturally gravitate to the service in which they were educated.

During time of peace, the navy yards might with advantage be reduced to four; three, New York, Norfolk, and Pensacola, on the Atlantic coast, and one, Mare Island, on the Pacific; with a fresh water basin for iron vessels. But, as the extent of our territory would render the yards closed very valuable in time of war, sufficient money should be

annually appropriated to keep them from deterioration. In this connection, I would recommend that the complete control of the navy yards, even to the exclusion of local politicians, should be by law given to the naval officers in charge. The officers might then be held strictly accountable for the work done, and the spectacle of a large increase of the working force prior to elections and the discharge immediately after, happily not visible during the present administration, but so common in former days, would be avoided.

With these few suggestions I bring my remarks to an end. I have shown that the United States does not possess a navy commensurate with its wants, and I have pointed out what I believe to be the best way of properly developing our naval strength. But, after all, it is Congress which decides the naval policy of the country, and it is to Congress therefore, that we must look for the means to accomplish our end. The recommendations I have made apply equally well, in event of the continuation of the present economical policy towards the navy, or should Congress determine that the time had come to again strive to be foremost in the struggle for the commercial supremacy of the world. Sooner or later the day will come when the nation will again enter the arena ; let us then endeavor to be so prepared that in the heat of the strife we may not be disheartened by a discovery of fatal weakness in our trusted weapons.

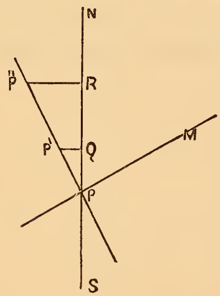
December, 1879.

PROFESSIONAL NOTES.

These Articles have not been read before the Institute, but are inserted by direction of the Executive Committee.

To Determine by the Aid of Azimuth Tables the Effect upon the Longitude of a Change in the Latitude Used in Working a Time Sight.

Proposition. The departure due to a change of one minute in the latitude used in working a time sight is the tangent of the difference between 90° and the azimuth of the body observed.



Let P be the position whose longitude has been computed with the assumed latitude. N S is the meridian through P. M is the body observed, and N P M is its azimuth. P P′ P″ is the line of position perpendicular to P M. The angle NPP″ is the difference between 90° and the azimuth. Let P′ be a point on the line of position whose latitude is one minute greater than that of P. The departure due to this change of latitude is P′Q. The tangent of NPP″ is $\frac{QP'}{QP} = QP'$, since QP is, by hypothesis, equal to one. Therefore QP′, or the departure due to a change of one minute in the latitude, is the tangent of the difference between 90° and the azimuth.

Suppose P″ to be a point on the line whose latitude is a minutes greater than that of P. Then $RP'' = QP' \times a$, or the departure for any change of latitude is equal to the departure for one minute multiplied by the number of minutes.

The error due to the assumption that RPP″ is a plane triangle is not appreciable for ordinary purposes.

The annexed table is formed by changing the natural tangents from decimals of a minute into seconds.

TO MAKE USE OF THE METHOD.

TABLE.

Azimuth. ∼ 90°	Departure.	Azimuth. ∼ 90°	Departure.
1°	1″	31°	36″
2	2	32	37
3	3	33	39
4	4	34	40
5	5	35	42
6	6	36	43
7	7	37	45
8	8	38	47
9	10	39	49
10	11	40	51
11	12	41	53
12	13	42	54
13	14	43	56
14	15	44	58
15	16	45	60
16	17	46	62
17	18	47	64
18	19	48	67
19	21	49	69
20	22	50	71
21	23	51	74
22	24	52	77
23	25	53	80
24	27	54	83
25	28	55	86
26	29	56	89
27	31	57	92
28	32	58	96
29	33	59	100
30	35	60	104

The time sight being worked out, enter the azimuth table with the latitude and declination used and the apparent time, or hour angle, computed, and take out the azimuth corresponding. With the difference between this and 90° enter the table given and take out the departure for one minute in seconds of arc. With this departure and the latitude enter the traverse table and take out the corresponding difference of longitude. Multiply this by the number of minutes of change in latitude, and the result is the required difference of longitude. The sign of application of this correction to the longitude computed, may be readily determined by a consideration of the direction of the line of position.

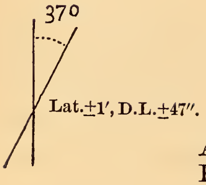
Example.

At Sea, 8.30 A. M., Sunday, 21st Dec., 1879,
Latitude 15° 47′ N. I. C. 0

	h.	m.	s.
C.	12	25	04
W.	8	20	00
C.—W.	4	05	04
W.	8	27	28
C.	12	32	32
C. C.		2	27
G. M. T.	12	34	59
	—11^h. 4		

☉'s Dec. S. 23° 27′ 12″ + 1″. 0 H.D.
12 —11 4
P.D. 113 27 00

Eq. T. 1^m. 47^s.— 1^s. 2 H.D.
14 —11 4
2 01 13 2
5
13 7



⊙	25° 50′ 20″			
	10 10			
	26 00 30			
	15 47 00	10.01669		
	113 27 00	10.03744		
	155 14 30			
	77 37 15	9.33119	S.D.	16′ 16″
	51 36 45	9.89423	Par.	08
		19.27955	Dip.—	4 14
		9.63978	Ref.—	2 00
				10 10

App. T.	8^h. 33^m. 03^s.
E.T.	2 01
L.M.T.	8 31 02
G.M.T.	12 34 59
Long.	7^h. 56^m. 03^s.=119° 00′ 45″ E.

Entering the azimuth table with Lat. 16° N., Dec. 23°, 27′ S. App. T. $8.^h$ 33^m, we find the azimuth to be N. 127° E. Entering the given table with 37° the departure corresponding, for one minute of latitude, is 45.″

From traverse table, with Lat. 16°, the corresponding D Long. is 47.″ The sign of application is evident from sketch of line of position.

The position at 8.30 A. M., carried forward to noon, gave 15° 35′ N. 119° 09′ 45″E, but observation at noon determined latitude to be 15° 45′ N; therefore true longitude at noon was 119° 09′, 45″ E + 47″ × 10 = 119° 17′ 35″ E.

The method has the advantage of enabling the Navigator to correct his position at noon instantly for any difference between the latitude by observation and dead reckoning, the error for one minute having been determined at the time of working the morning sight. It also enables the second point of the Summer line to be readily determined for the sun or any other body whose declination falls within the limits for which the azimuth tables have been computed.

The use of the method gives the Navigator a clear idea of the value of a sight without the necessity of plotting the line of position, and suggests the ease with which he may, when uncertain of his latitude, find from the tables the time of crossing the prime vertical, and take his sight at, or near, that time.

C. S. SPERRY, Lieut. U. S. N.

DEVICES FOR LESSENING THE DANGERS OF THE SEA.

To the Cor. Secretary of the Boston Branch of the U. S. Naval Institute.

I beg leave to call your attention to certain devices for lessening the dangers of the sea, which, though not new, it may be well to discuss in these times when collisions at sea and along shore follow in quick succession. I have deposited at the Naval Lyceum a rough model made by my unskilled hands of a boat and davit, such as I put upon the Meteor in 1865, and which worked satisfactorily; it will be seen that it consists of two solid stanchions bolted to the side of a ship, to which are attached two flat iron davits or "dericks," connected by a spar to which the boat is hung by tackles as usual; these davits are steadied by permanent guys leading fore and set up in line with the foot of the davits, so that there is no necessity for coming-up the guys in swinging the boat in and out.

The Boat can be secured in three positions; first, ready to lower clear of the side; secondly, stowed over the gunwale or hammock netting, and last, inboard, ready to be stowed in chocks as in a vessel with a hurricane deck, or kept suspended inboard in a vessel with an open deck. It will be observed that the tackle falls by which the boat is hoisted and lowered, pass through a leader near the foot of the davit, so that, when made fast, there will be no movement of the boat in a vertical line by the slacking or tautening of the tackles when she is swung out or in; it will also be noticed that there are two tackles attached to a short chain passing through a fixed leader on the head of the stanchions; the object of these tackles is not to pull in the davit and boat when suspended outboard, but merely to take in the slack of the chain as the davit comes in, and, on the other hand, to ease her down to the stowing point in suspension—or into chocks.

In an arrangement for a large boat these pennants may be of chain, or of supple wire rope; the davit is to be kept from going too far out or too far inboard, by a toggle or other device near the upper end of the tackle block. The intention is to swing the boat in by a pennant or tackle at the end of each davit leading across the deck; the amount of purchase necessary to accomplish this, must of course depend on the weight of the boat and the number of hands available for the work; for the boat of a small yacht, it will only be necessary to pull her in and ease her out by hand; but for a heavy boat a tackle or at least a

whip will be necessary. When the boat is to be stowed in the upright position over the gunwale, a pin passing through the stanchion and the bar davit secures her there; for a large boat chocks on the rail or gunwale to land her in will be useful if not necessary. If, as in some vessels of war, a light boat is to be hung on the same davit as a cutter, it will be necessary to elongate the bar davit, curve it outward a little, and place a light spar fore and aft, as in the case of the other boat; but, for steamers carrying passengers, and for merchant vessels, two boats hung to one davit will not be proper. This arrangement, while well adapted to war ships, is more specially devised and recommended for passenger vessels and most especially for such steamers as navigate our sounds and rivers, where in general there are few expert, well drilled seamen to manage. It is an excellent plan for the smallest yacht. In examining my rough model on so small a scale it will be necessary for you to make some allowances for my imperfect mechanism. The common crooked davit is open to several objections, one of which is often mitigated by causing the davit to swing in and out through a projecting clamp with pins and holes to confine the davit in the position to lower the boat, and also to keep it upright near the side of the ship still the fore and aft guys and the Toppinglifts must be tended.

My opinion (perhaps worth very little for a man-o-war) is that no boat davit should depend much on any attachments by lifts to the vibrating masts; but that each davit should depend for its integrity on the fixtures to the hull of the ship instead of placing boats abreast of the rigging in order to avail ourselves of lifts leading to the masts. I prefer to place my boats where there is nothing to prevent swinging them directly in board, and if necessary lowering them into chocks. It may seem out of place to you, gentlemen, all of whom are supposed to be experts in devices for the management of boats and ships, for me to say so much on so small a thing; but in these days of collisions and maritime suicides it may not be in vain for me to go into these minute details, in the hope that some precious lives may be saved by adopting a simple boat davit. It may be a small thing to allude to the usual manner of arranging the tackles of boats; it is usual and I may say customary in the boats of merchant ships, and invariable in coasting steamers to place a ring in the stem of the boat somewhat far down out of the way and a swivel hook in the lower tackle block; now, in lowering a boat not provided with a patent detaching apparatus which no stranger knows how to operate, when she strikes the water down falls the heavy block, and so jambs the hook and ring that it is not

very easy to unhook it, especially if as usual the boat is bobbing up and down, and instances are not rare of jammed fingers, and of the bow being first unhooked, when the painter not being led along forward, round swings the boat and she swamps or is so entangled that she must be cut adrift. In my arrangement, as illustrated in the model before you, the ring is placed in the block, and the hook is a permanent fixture in the boat. Every seaman can easily appreciate the simplicity and usefulness of this plan as a life-saving and finger-saving device as compared to the other. I trust you will pardon me for saying so much on so small a matter. I beg leave to present to you a small pamphlet just printed and for sale by Messrs. A. Williams & Co. entitled "The life-boat and other life saving inventions." It is mainly copied from the "Journal of the National life-boat Institution for Aug. 2, 1880" by permission of the authorities thereof and contains very little original matter. My intention was to circulate freely a large number of this brochure on the occasion of the celebration of the 250th anniversary of the settlement of Boston, on the 17 instant, but, owing to circumstances beyond my control, it could not be done, and so I conclude to make the most of them by distributing them among personal friends and selling to those who choose to pay a small sum.

Regretting that my health prevents my reading this paper myself,

I am, very respectfully, your servant,

R. B. FORBES.

Sept. 30, 1880.

BREAKING UP OLD GUNS BY DYNAMITE.

Two old guns, captured from the Turks, were destroyed, in Dec. 1879 by Capt. Elsner, in the following manner. The guns, one 9.5 cm calibre, 1.52 m. long, the other 10 cm. calibre, 65 cm. long, with flaring mouth 17 cm. in diameter were fastened upright by burying their cascables in the earth; the vents were then plugged and the bores filled with water. The first gun was charged with 0.96 kg. of dynamite, held in two cylindrical zinc boxes, 15 cm. long and 5 cm. in diameter, which were lashed butt to butt with projecting strips of wood lashed to the sides. By this means the charge of dynamite was brought in line with the trunnions, 23 cm. above the breech. An ordinary priming cartridge

with a Bickford fuze was attached to the upper charge and ignited. After the explosion, the cascable remained in the ground while the end of the chase, 30 cm. long, with a strip 6 cm. broad, blown from its side was found about twenty paces off, the remaining pieces, averaging from 15-20 cm. in length and from 6-10 cm. in width being scattered about within a radius of one hundred paces.

The second gun was charged with 0.72 kg. divided into one charge of 0.48 kg. with two of 0.12 kg. tied beside it. It was fired in the same manner as the first but the bottom of the bore was filled with stones to bring the dynamite in line with the trunnions. In this experiment, the cascable was split, and fragments of the gun, averaging from 10-15 cm. in length and from 6-10 cm. in width were scattered about within a radius of one hundred and fifty paces.

In examining the charges of dynamite hitherto employed for breaking up cast-iron guns, no agreement as to the necessary quantity can be found. Part 1, for 1875, of this Journal records the results of some experiments made in France, shortly before. The guns broken up with dynamite (No. 1) were one each of the following calibres, 16.4 cm. (30 pdr.), 15.3 cm. (24 pdr.), 13.4 cm. (16 pdr.), and a 32 cm. mortar. The charge of dynamite was divided into three parts, one being placed in the base of bore, one in the axis of the trunnions, and one in the muzzle; all three filling the bore completely, the spaces between being filled with water. The estimation of the distributed charge necessary was arrived at by the following formula :—

$$L = 77.4 \frac{R^2 - r^2}{r^2} \qquad (1)$$

in which r is the diameter of the bore in mm., R is the distance from the axis of the bore to the outside of gun in mm., and l the amount of dynamite necessary, in grammes.

During the same year, two cast-iron guns of 12 cm. and 13 cm. calibre, were broken up by dynamite (No. 1), in Ingolstadt. One charge only was used—placed probably in the bore, opposite the thickest part of the gun, the remaining space being filled with water. Before explosion the gun was lowered into a pit, where it lay at an inclination of 45° to the horizon, against the side of the pit. The estimation of the amount necessary to destroy the gun by means of a single charge was obtained from the following formula :—

$$L = 0.0001 \text{ Q. Kg.} \qquad (2)$$

where Q is the weight of the gun in kilogrammes. This gives one gramme of dynamite for ten kilogrammes of iron. The charge taken for the 12 cm. gun weighing 1650 kg. was 0.165 kg., and for the 13cm. gun, weighing 2360 kg. was 0.236 kg., and by them the guns were blown into twelve or fourteen pieces.

Let us compare the results obtained with the German 13 cm. gun with those given by the French 13.4 cm. gun, weighing 2220 kg. According to formula (1), there was needed for the French gun 1.47 kg. in the base of bore, 0.747 kg. in the axis of the trunnions, and 0.658 kg. in the muzzle; a total charge of 2.447 kg., ten times the amount placed in the German gun. The latter was blown into twelve or fourteen pieces and the former into one hundred and thirty pieces, the largest weighing 158 kg.

The heavier Turkish gun, weighing between 450 and 500 kg. was broken into about fifty pieces; the lighter, weighing between 370 and 400 kg. into about forty pieces. Applying formula (1), we have for the heavier gun $r=47.5$ mm., R_1 for base of bore$=200$ mm., R_2 for the trunnion axis$=140$ mm., and R_3 for muzzle$=130$ mm. These values substituted give $l_1=1295.$ grm., $l_2=594.$ grm., $l_3=502.$ grm., a total charge of $l=2.3911$ kg, more than two and a half times greater than the charge used. But by formula (2) we find the charge required for this gun, $L=50$ grm. to be only one nineteenth of the amount actually used. For the lighter gun we have $R_1=200$ mm., $R_2=160$ mm., $R_3=110$ mm., and $r=50$ mm.; and by substitution in formula (1) we have $l_1=1161$ grm., $l_2=715$ grm., $l_3=297$ grm., a total charge of 2.173 kg. But from formula (2), we have $L=40$ grm., and we again find a large discrepancy in the size of the charge required. From formula (2) there can be found the minimum charge of dynamite which will break a gun into large fragments. In formula (1), it is obvious that the ratio of the charge increases as the calibre decreases.

In Part 17, "*des Technischen Unterrichtes fur die K. K. Genie Truppe,* we are directed in estimating the explosive charge for cast iron guns to reckon 0.1 kg. of dynamite for each centimetre of the calibre of the bore. From this we would have for the larger Turkish gun of 9.5 cm. calibre, 0.95 kg. of dynamite which was the amount used in the experiment.

Translated from the Mittheilungen über Gegenstände des Artillerie und Genie-Wessens. 1880, 5*th Part by Prof. C. E. Munroe.*

ON TORPEDO BOAT TACTICS.

Translated from the Mittheilungen aus dem Gibiete des See-wesens. (Vol. VII, No. 4.)

By Thomas Brassy Esq., M. P.

We are informed that the Russian Navy was supplied with no less than one hundred and twenty torpedo boats in the course of last year. To train the crews, and establish a definite system of torpedo tactics, twelve of these boats were kept in commission last summer; and thus the commanders who had completed the greater portion of the torpedo course, as well as the crews, had an opportunity of making themselves familiar with the method of handling these boats, and with the system of torpedo manœuvres generally. The experiences acquired in the course of the commission have been brought together by Lieut. Witheft. They were discussed at a conference of officers belonging to the Torpedo School and the Navy generally, and they are epitomized in the following paper.

Torpedoes were employed most extensively in the American war, and no less than forty ships were destroyed. The greater number of these ships were blown up by defensive torpedoes, and only a small portion by the offensive torpedo. The conditions of torpedo warfare remained unchanged until the successful results of offensive operations in the Russo-Turkish war encouraged the Russian Government to order the large flotilla of torpedo boats already referred to. It was in that war that the aggressive torpedo, in the hands of adventurous and daring men, was shown to be a weapon capable of being used with the most deadly and decisive effect, and, after a certain amount of successful practice in the management of these small crafts, it clearly appeared that they could be employed as aggressive weapons, with much less risk than might be inferred from the results of the earlier attempts, which had been made in America. To insure success, you require a good *materiel*, and the boats must be managed by men trained to the peculiar and hazardous service which they will be called upon to undertake. Every division of torpedo boats should be instructed how to conduct an attack with every prospect of success, without the support or coöperation of any other naval arm. In the recent Russo-Turkish war, nine attacks in all were made with torpedo boats; viz., 1, by Dubasoff and Schestakoff, on the Danube; 2, in the roadstead of Batoum; 3, by Skridloff, on the Danube; 4, by Niloff, on the Danube; 5, by Puschtschni, Zatzarennyi, and Roschdestrocuski, at the Sulina mouth; 6, in the roadstead of Soukoum-Kalé by Zatzarennyi, Pisarews-

kyi, and Wischnewetski; 7, in the roadstead of Batoum, by Zatzarennyi and Schtschetinski. The remaining attack was conducted by submarine mines in the Sulina mouth of the Danube.

When we come to examine the incidents of each of these attempts which were attended with a greater or lesser measure of success, without entering upon a general criticism of the campaign, it will be remarked that every attack was successful when undertaken according to a well matured plan by a group of torpedo boats; and that no attack succeeded that was made by a single boat. As an illustration, we may point to the attack made by Dubasoff and Schestakoff on the Turkish monitor, to the attack made by the boats of the Constantine in the roadstead of Soukoum, and to the attack on the guard ship at Batoum, by the boats of the Constantine, with the Whitehead torpedo. All the other attacks were unsuccessful, including the solitary attacks by Skridloff and Niloff, as well as the attacks, which were undertaken indeed by a group, but in which one of the boats, owing to undue precipitation, made an attack unsupported. Thus it happened in the first expedition against Batoum, and in the attacks at the Sulina mouth.

When we turn to the equipment of the torpedo boat, the first and most essential point is, that the torpedo and the torpedo boat should, so to speak, form one single weapon, so that the attention of the commander may never be divided between the conduct of the boat and the handling of the torpedo. A second essential is, that the arrangements should be such as to secure the instantaneous explosion of the torpedo, without the chance of a miss-fire. These two conditions apply more to the case of the torpedoes which are fired automatically, or by electricity. There must be a double set of conductors for the electric fluid, and the igniting apparatus must act upon receiving a slight blow. The equipment of the spar torpedo requires that all the gear should be exposed. This is not the case with the Whitehead. To hit a target of the size of a ship with a spar torpedo demands no peculiar dexterity, although the attack often fails from the colliding of the boats engaged. On the other hand, the success of the attack is certain, if the blow has been dealt home. The assailant know precisely what is taking place and the fate of his adversary is decided before his eyes.

There are not many advocates for the towing torpedo. As a means of attacking ships, which are protected by barricades or other obstructions, (and we must expect hereafter to deal with obstructions of that nature) this torpedo may be reckoned as altogether ineffective. Again there is great risk that the tow line will foul the propeller, as happen-

ed in the case of the boats of the Constantine on two occasions. Opinions are generally in favor of fitting boats with spars carried on the side. Although this method has been definitively adopted, it may not be superfluous to state the reasons why torpedoes so fitted have been found useless on certain occasions. The advocates of the towing torpedo insist on the facility with which the enemy may be attacked on the broadside, without slackening speed on the part of the assailant. Such an attack is almost free from danger to the assailant; but it does no injury to an enemy protected by obstructions. The harmless explosions will only steel his courage and accustom him to await calmly all future attacks. The attack with the spar torpedo presents some points of difficulty. The boat may be too far from, or perhaps some feet too near the enemy's ship. In the former case, the automatic explosion inflicts little damage: while in the second case, that, namely, when the boat is too near, and the spars cannot be extended to their full length, it may happen that the explosion may cause damage to the boat itself. These are the grounds on which the use of the spar torpedo on the broadside does not altogether commend itself.

It is usual to supply torpedo boats with drifting torpedoes. In order to use them it is necessary to place the torpedo boat in the path of the enemy's ship, the impact of which causes the torpedo to explode. The chief defect of this description of torpedoes consists in this, that they explode not under the ship, but at the water line. Hence if the ship be protected by nets or other obstructions, the torpedo can inflict no injury. The ship can be struck only when several torpedoes are fired in succession, and an opening is thus made in the obstructions. Even in this case, however, success is far from certain. In addition to this, where there is an ebb and flow of the tide, the drifting torpedo is as dangerous to your own ships as to those of the enemy: and at night, more particularly, it is impossible to get out of its way. Drifting torpedoes are therefore to be used by the torpedo flotilla, only in cases where the attack is being undertaken according to a plan laid down beforehand, with sufficent accuracy, and it can be known to every man taking part in the expedition, where and when the torpedo is to be used. Having recognized these two important defects, it may be inferred that these torpedoes are chiefly valuable as a means of destroying the *morale* of the enemy, and fettering his movements by the apprehension that he may possibly encounter one of these weapons every time his ship is brought to a stand-still. As an engine of destruction, these torpedoes cannot yet be accepted as practically effective.

From this general view of the *matériel* of torpedo warfare we turn to the tactics to be employed in the use of these weapons. It has already been observed that an isolated attack with torpedo boats must only be attempted in exceptional circumstances. It must be assumed that the vessel which it is proposed to attack is protected with nets or floating obstructions. If a division of torpedo boats is available for the proposed attack, it will be desirable to break up the division into three groups, to each of which a special duty will be assigned. Further, each boat in the several groups must confine itself to the special task which has been assigned to it. Assuming that the enemy is effectually protected by obstructions, nets, or other barriers, the first group is required to remove them. The second group makes the attack. The third group is held in reserve. Their task consists in rendering help and filling up any losses caused in the two leading groups by the defence of the enemy. As soon as each group has been completed, and their precise duties have been assigned to them, the operations must be carried out according to a well-considered and well-defined plan.

The pioneer group after their task has been completed will fall back into the reserve. The attack must be made simultaneously by the boats of the attacking group. The speed of all the boats must be regulated by the speed of the slowest boat. The commandant of the division, who must take his place in one of the boats of the reserve division, gives the signal for the attack. The highest speed of the slowest boat should be made the maximum speed as long as possible, so as to ensure that each boat shall come up to the attack at the right time. The farthest stations will be assigned to the slowest boats, so that all may come up with the enemy simultaneously. The engines should be slowed at some fathoms distance, and should be reduced to half speed when about twelve fathoms from the object. By adopting these dispositions it is possible for the commandant of the boats to satisfy himself that his own spar, with the torpedo attached to it, remains uninjured up to the last moment before the blow is delivered, that it is clear of the spars rigged out from the other boats in the group, and that the electrical firing gear is in order. It is to be observed that the risk of injury to the electrical explosive apparatus is not so great as when submerged spars are used. The electrical firing gear should be used only when the automatic gear fails; otherwise it may happen. if the distance has been misjudged, that the torpedo will be fired too far from the object. The torpedo should be brought under the ship's bot-

tom. If the Whitehead torpedo is used, care should be taken not to aim at a vessel amidships, for there the armor is carried down to a considerable depth under water. A spar torpedo will in case of necessity be used against a perpendicular broadside. The effect of the explosion, the torpedo striking at an acute angle, will in most cases be greater in proportion as the centre of the charge is brought closer to the ship's side.

From what has been said it will be obvious that, in order to ensure a successful result, the attack should be made from at least four points before or abaft the beam, whether on the port or starboard side. For such an attack there will be required four pioneer boats, to clear away the obstructions round the ship, four boats to make the attack, two boats in reserve, and one for the commander of the division—in all eleven boats.

Even supposing the newest type of torpedo boat to possess contrivances for closing all apertures simultaneously, experience proves that officers, as well as men, prefer to make the attack with open hatches, a circumstance which would probably be the cause of some loss of life. This can, however, scarcely be a point of serious importance, since a torpedo boat with a speed of ten knots would only require 4.8 minutes to pass over a distance of fifteen hundred metres exposed to the enemy's fire. The prospect of great loss of life would delay, or even entirely defer, an attack, although in former times many boat expeditions and boarding attacks, requiring much more determination, and involving the probable loss of many lives, have been carried out successfully. The attack by torpedo boats is, in fact, a kind of boarding attack under far more favorable conditions for the attacking party than in the old days, the cutlass, the boarding pike and the battle axe having been supplanted by electric and automatic firing apparatus. If only five of the eleven torpedo boats sent forth on an expedition return uninjured, they will have succeeded in their task; the other six will only have performed their duty, and their loss will be fully repaid by the destruction of the enemy's ship. The results of the attacks by torpedo boats in the course of the late war, which were carried on latterly almost without any loss on the part of the assailants, cannot be regarded as very considerable. In the future, we shall probably have to deal with enemies more determined and alert, and a more serious loss in men and *materiel* must be anticipated. When a boat is destroyed in the attack it does not necessarily follow that the crew should lose their lives. The attack must be made stealthily, so as not to attract

the attention of the enemy. This will not be so easy in the future as in the last Russo-Turkish war, although it is true that in that war, boats of a speed of from six to eight knots were used, while the new boats will make their attack at speed of thirteen knots.

It is difficult to give any positive opinion as to whether it is best to make an attack in broad day light. In very dark, stormy nights, the enemy will generally be more watchful. A single ship can scarcely be defended effectually, even in the day time, against a flotilla of torpedo boats. Our present experience scarcely enables us to say whether the attacks in the day, or those in the night, have the best chance of success, even assuming there may be a greater loss of life in the former. It may happen that you find an enemy who, having observed a division of torpedo boats coming down upon him, has made every preparation to repel their attack; but it does not follow that he may be able to make an effective defence. Here it would seem that the chances of success are greater in a daylight attack. A ship attacked in the night can make use of the electric light; the assailant should endeavor as long as possible to keep out of sight, and therefore the torpedo boats should be painted of such a color as to be the least conspicuous under the electric light. The usual dark grey colors are conspicuous, inasmuch as they appear much lighter, and indeed become a pure white when seen by the electric light. Experiments in the Black Sea showed that a light brown or chocolate was the least conspicuous color.

It is to be remarked that no special code of signals has yet been devised for torpedo boats. In the absence of these two boats belonging to the same fleet may possibly attack one another. The equipment of the torpedo boats with machine guns deserves very careful consideration; it is still difficult to pronounce an opinion as to their suitability. In making an attack it will be impossible to open fire with these weapons; they can be employed with effect only against boats, or to cover a retreat. The pyroxyline rockets may be found more useful: they have been supplied to torpedo boats; they do not load them too deeply, take up little room, and can be used with equal advantage for signaling purposes both in advancing to the attack and in retiring. The explosion of these rockets on board the ship which is attacked would create no small confusion.

The general conclusions to which we have been led by the foregoing observations on attacks by torpedo boats may be summed up as follows:——

1. Attacks by single boats are only to be attempted as a last resource

2. The attack must be made according to a carefully considered plan.

3. The torpedo boats are to be equipped with either the Whitehead or the spar torpedo.

4. A squadron of torpedo boats must be divided into groups; the pioneer group, the assaulting group, and the reserve group.

5. The torpedo should be fired automatically, and only when this plan fails should the electrical firing apparatus be employed.

6. Thespar should be sunk as soon as the boat is reduced to half speed or stopped. At full speed the spar should be triced up clear of the water.

7. The attack should be made, at a signal from the commander, simultaneously from several points,

8. The speed of the torpedo boats before the attack, until they reach the positions which have been assigned to them, should be regulated according to the speed of the slowest boat.

9. The commander of the division should remain in the rear, with the boats of the reserve group.

10. The torpedo must be brought in contact with the bottom of the unarmored ends of the ships.

In order to be able to apply all these rules effectively in war, it is necessary in time of peace to train every torpedo division to apply them as far as possible, under the conditions which would arise in actual warfare. This would be easily effected if the manœuvres of an attack were intelligently put in practice according to a predetermined plan, against a fleet at anchor and under way, with dummy torpedoes. At the end of the course of instruction, an attack might be made as a test of the efficiency which had been attained with loaded torpedoes against a raft or pontoon towed.

It is only after considerable practice that success can be obtained in this new method of warfare. Trials with single boats can only be regarded as a preliminary to manœuvres with a complete division of boats. They in no way ensure success when a boat is for the first time attached to a division, without having been exercised in making attacks of a similar nature in time of peace.

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ERRATA, NO. 13, VOL. VI.

Page 258, line 34, constant should read *constant.*

" 259, " 16, for Agricoca, read Agricola.

" 259, " 16, for De Re Metallica, read "De Re Metallica".

" 259, " 18, for Brindjonc, read Brindejonc.

" 259, " 19, for Oerochalinos, read Aerochalinos.

" 259, " 26, for Fulton, read Sutton.

" 259, " 39, for Iouchon, read Souchon.

" 259, " 39, for Defaix, read Desaix.

" 259, " 39, for Ichiele, read Schiele.

" 259, " 40, for Poisenille, read Poiseuille.

" 259, " 40, insert after Williams, Reid, 1844.

" 259, " 40, for Beaumaoir, read Beaumanoir.

" 259, " 51, after Thompson, '73, insert Thomas, '73.

" 259, " 52, for Yaum, read Yarrow.

" 259, " 53, for Dr. Gibbs read Dr. Gibbs', .

" 259, " 56, insert commas after Roddy, Delano and Norton.

[illegible] Concerning the Capture of the Huascar. - - [illegible]

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